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Program Evaluation • Consultation • Market Research

Summative Evaluation of *Einstein's Big Idea*

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Submitted to
WGBH-TV Boston

May 2006

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EXECUTIVE SUMMARY

In 2004, WGBH received partial funding from the National Science Foundation to create *Einstein's Big Idea*, a two-hour docudrama on Einstein and the history of the formula $E=mc^2$. Based on the book *$E=mc^2$, A Biography of the World's Most Famous Equation* by David Bodanis, the program highlights the stories of those who helped develop the key concepts that make up the equation, with a particular focus on how Einstein pulled together these concepts to create $E=mc^2$.

Through these stories, *Einstein's Big Idea* focuses on four themes that served as learning goals for the project. The four themes are: (1) science is a human endeavor, (2) science thrives on the contributions of outsiders, (3) science impacts society, and (4) scientific advances often generate ethical dilemmas.

WGBH also developed a Web site to accompany the *Einstein's Big Idea* program. The Web site provided additional information about Einstein, his work, and modern day applications of $E=mc^2$, including a number of interactive activities. A timeline of Einstein's work and information on the other scientists who contributed to the creation of the equation were also presented.

To extend the impact of the program, WGBH created a Library Resource Kit (referred to hereafter as the Guide) that was distributed to all libraries around the country. The Guide included display materials and program ideas for librarians to use with their child, young adult, and adult patrons. WGBH worked closely with 20 libraries that were selected through an RFP process to serve as model sites for the project. Each of these libraries was provided with continued support throughout fall 2005 as they implemented *Einstein's Big Idea* events.

Goodman Research Group, Inc. (GRG) was contracted by WGBH to conduct a summative evaluation of *Einstein's Big Idea*. GRG's evaluation assessed how successful the program, Web site, and Guide were at accomplishing the learning goals defined above and teaching the key concepts covered by the project. Specifically, GRG's evaluation included:

- Two pre-post viewer studies, one with regular NOVA viewers (N=44) and one with high school students (N=52) who watched the program as part of their science class,
- A Web site feedback survey of 1,544 Web site visitors,
- A process evaluation of how libraries used the Guide with a primary focus on the 20 model library sites and a secondary focus on how national libraries used the Guide (N=99), and
- Post-only surveys of child, young adult, and adult library patrons who attended events at model sites (N=2,016).

KEY FINDINGS

The *Einstein's Big Idea* offerings appealed to the target audiences.

The vast majority of participants in the two viewer studies rated the program positively with adults rating it as *very good* or *excellent* and students rating it as

good to *very good*. Similarly, the majority of visitors to the Web site indicated that they were *very* or *extremely* satisfied with the site, and reported that it was easy to navigate and that they were able to find the information they wanted. Further, they reported that they will visit the site again.

Adults, young adults, and children who attended *Einstein's Big Idea* library events provided positive feedback about their experiences. Over half of adult and young adult audiences reported that their event was *very* or *extremely enjoyable*. Similarly, most children reported that they had *a lot* of fun at their event. The majority of adults and children reported that they would be interested in attending similar events in the future.

Einstein's Big Idea programming succeeded in teaching the basic content related to $E=mc^2$.

As a result of watching the program, both NOVA viewers and high school students reported learning about the different pieces of the $E=mc^2$ equation. More importantly, each group showed statistically significant increases in their ability to identify the terms of the equation after watching the program.

Visitors to the Web site reported learning from *some* to *a great deal* for each of the seven key concepts surveyed. The equation $E=mc^2$ itself was among those concepts with the highest reported level of learning. Likewise, library event attendees in all three age groups reported learning from the event. Adult and young adult audiences reported learning content related to the $E=mc^2$ equation, with young adults, in particular, reporting the highest level of learning in this area.

Einstein's Big Idea also succeeded in teaching other key concepts.

The NOVA program was particularly effective in providing NOVA and student viewers with a deeper understanding of the multiple scientists whose work contributed to the famous equation. Adults, in particular, reported learning about women and other "outsiders" in science at a high level. Both NOVA and student viewers reported that they were encouraged to think more about the program's learning goals as a result of watching the show.

Visitors to the Web site reported high levels of learning related to Einstein and the other scientists who contributed to the equation, and the relevance of the equation to life today. They also increased their understanding of science as a human endeavor, a creative process, and a field that thrives on the contributions of diverse groups of people. In a similar vein, library patrons of all ages reported learning about all of the program's key concepts from their library event. Almost all children reported learning something at their event, with most reporting that one thing they learned about was *science*.

Einstein's Big Idea succeeded in prompting further exploration of the key concepts and related ideas, especially from the other program components.

After watching the NOVA program, almost all NOVA viewers either continued engaging with content related to *Einstein's Big Idea* or had plans to do so. Many

had visited the program's accompanying Web site or taken other steps to learn more. Approximately one-quarter of students also planned to continue engaging with the program's content.

Most visitors to the *Einstein's Big Idea* Web site indicated that it had increased their interest in watching the NOVA program. The opposite was also true, with many survey respondents reporting that they visited the Web site to learn more after watching the show.

Both adult and young adult library patrons reported that they would continue engaging with content related to *Einstein's Big Idea*, with adults being more likely to report an interest in this area. Almost three-quarters of adult patrons reported that they planned to watch the show after attending their library event.

RECOMMENDATIONS

The current evaluation demonstrated that *Einstein's Big Idea* was a successful program. Each component was received favorably by its target audience, and consumers of each component learned new information and were motivated to think about the program's goals. Given these findings, GRG recommends that WGBH build on the success of this program in the following ways:

The docudrama presentation format of the *Einstein's Big Idea* NOVA program appealed to its audience and was particularly effective in teaching science across history. GRG recommends that WGBH consider producing selected NOVA programs in this format, as appropriate. Further, data from across program components indicated that $E=mc^2$ is a topic of interest to the public. WGBH may want to build on this interest by creating new programming to explore in more depth the components and use of the $E=mc^2$ equation.

The *Einstein's Big Idea* Web site offered a range of resources for visitors. The evaluation confirmed that visitors took advantage of these different types of resources, with visitors spending the most time reading articles in the *Inquiry & Articles* section and selecting a feature from the *Interactives, Audio and More* section as their favorite. GRG recommends that WGBH use this formula as a model for future Web sites that will allow visitors to learn about and experience NOVA concepts through multiple feature formats.

Finally, the *Einstein's Big Idea* library events have confirmed that libraries are interested in and effective at implementing science-based outreach initiatives. The model library sites, in particular, demonstrated the potential reach of this kind of outreach. Further, the model sites reported that they do not often have the opportunity to host science-based programming and that it was an effective way to highlight their science collection. GRG recommends that WGBH continue to use libraries as a source for outreach effort. We further recommend that WGBH replicate the use of model library sites in future projects.

INTRODUCTION

In 2004, WGBH received partial funding from the National Science Foundation to create *Einstein's Big Idea*, a two-hour docudrama on Einstein and the history of the formula $E=mc^2$. Based on the book *$E=mc^2$, A Biography of the World's Most Famous Equation* by David Bodanis, the program highlights the stories of the men and women who helped develop the key concepts that make up the equation, with a particular focus on how Einstein pulled these concepts together to create $E=mc^2$.

The program shows Einstein at different points in his educational and professional career as he grapples with scientific concepts, often with his first wife, scientist Mileva Maric. Throughout, Einstein's story is intertwined with the stories of those who also contributed to the creation of the famous equation, including: Michael Faraday, whose research laid the groundwork for the modern scientific concept of energy; Antoine-Laurent Lavoisier, an amateur scientist who proved that total mass is never lost regardless of physical transformation; James Clerk Maxwell, who showed that light is an electromagnetic wave that always travels at the same speed of 670 million miles per hour; Emilie du Châtelet, a mathematician who showed that the velocity of an object must be squared when calculating its total energy; and Lise Meitner, who was the first to show that an atom could be split, converting mass into energy, according to the formula $E=mc^2$.

Through these stories, *Einstein's Big Idea* focuses on four themes that served as learning goals for the project. The four themes are:

- Science is a human endeavor,
- Science thrives on the contributions of outsiders,
- Science impacts society, and
- Scientific advances often generate ethical dilemmas.

WGBH also developed a Web site to accompany the *Einstein's Big Idea* program. The Web site provided additional information about Einstein, his work, and modern day applications of $E=mc^2$. A timeline of Einstein's work and information on the other scientists who contributed to the creation of the equation were also presented. A number of interactive activities were also provided to demonstrate $E=mc^2$ in action. The *Einstein's Big Idea* Web site was launched in September of 2005.

To extend the impact of the program, WGBH also created a Library Resource Kit that was distributed to all libraries around the country. The Library Resource Kit (referred to hereafter as the Guide) included display materials and program ideas for librarians to use with their child, young adult, and adult patrons. In addition to the overall learning goals outlined above, the library programs were expected to:

- Build awareness of the broadcast program and increase viewership,
- Generate or enhance an interest in and understanding of the individuals highlighted in the programs, but more importantly in their fields of work and their impact on science and the world,

- Provide participants with opportunities to explore the process and methodology of science and to engage in scientific activities related to those highlighted in the broadcast program, and
- Expand public knowledge beyond the featured scientists and disciplines to include other individuals, especially women and minorities, and new, related fields of science that have grown from Einstein's work.

WGBH issued an RFP inviting libraries to submit proposals to become one of 20 model outreach sites. The libraries chosen received small grants from WGBH to implement a minimum of two *Einstein's Big Idea* events for their patrons. These libraries received training from WGBH at the 2005 annual American Library Association (ALA) Conference, and were provided with continued support throughout the fall of 2005 as they implemented their events.

Goodman Research Group, Inc. (GRG), a research firm specializing in the evaluation of educational programs, materials, and services, was contracted by WGBH to conduct a summative evaluation of *Einstein's Big Idea*. GRG's evaluation assessed how successful the *Einstein's Big Idea* program, Web site, and Library Resource Kit were at accomplishing the learning goals of the project defined above and teaching the key concepts covered by the project. In addition, feedback was gathered from users of each offering. The details of each of GRG's evaluation efforts are outlined in the section below.

INSTRUMENTS AND DATA COLLECTION PROCEDURES

GRG's evaluation focused on each of the three *Einstein's Big Idea* offerings: the NOVA program, the Web site, and the Library Resource Kit. The instruments and data collection procedures used for each are described below.

EINSTEIN'S BIG IDEA NOVA PROGRAM

To gather feedback about the *Einstein's Big Idea* television program and to learn the impact of the show, GRG conducted two studies. The first was conducted with regular NOVA viewers and the second with high school students who watched the program as part of their science class. The instruments and procedures used for each are described below.

Viewer Study with Regular NOVA Viewers

GRG conducted a Viewer Study in order to evaluate the impact of the *Einstein's Big Idea* television program. Fifty NOVA viewers (defined as people who watch NOVA once a month or more) were recruited from GRG's participant database to take part in the study. Respondents agreed to complete a Pre-Viewing Survey, watch the two-hour television program, and complete a Post-Viewing Survey.

Pre-Viewing Survey

The Pre-Viewing Survey gathered demographic information on respondents including their general interest in science and science programming. The survey also assessed respondents' knowledge about Einstein himself, the creation and meaning of $E=mc^2$, and the other scientists who contributed to the discovery of this equation. The extent to which respondents agreed with WGBH's four primary learning goals was also measured. For the purposes of the evaluation, the learning goals were modified linguistically (with approval by WGBH) as follows:

- Science is a creative process of human discovery;
- People of many different backgrounds have contributed to science;
- Science impacts almost every aspect of our lives; and
- Scientific advances often bring about ethical dilemmas

Once they had agreed to participate in the Viewer Study, each respondent received an email with a link to the Web-based Pre-Viewing Survey (see Appendix A). Data collection for the Pre-Viewing survey ended just prior to the show's broadcast. Forty-nine of the fifty respondents completed the survey.

Respondents were instructed to watch the national broadcast of *Einstein's Big Idea* on Tuesday, October 11, 2005. A total of 30 respondents watched the show on its debut night and an additional five respondents watched a re-broadcast of the program. Those who were unable to watch a national broadcast were sent a copy of the program on DVD; eight respondents watched the show in this way. In total, 45 participants completed this requirement of the study.

Post-Viewing Survey

Two weeks after watching *Einstein's Big Idea*, each of the 45 participants completed the Web-based Post-Viewing Survey.[1] This survey gathered feedback on the *Einstein's Big Idea* program. In addition, viewers reported how much they learned about key concepts from the show. A small number of content-based questions from the Pre-Survey were included to assess change in viewers' knowledge about $E=mc^2$ and the scientists involved in the creation of the equation. Lastly, the Post-Viewing Survey focused on the extent to which the program caused viewers to think more deeply about the program's four main goals (see Appendix B).

As part of the survey, respondents were asked to confirm that they had watched the program in its entirety. One respondent reported watching only one hour of the program, and thus did not complete the study. Respondents who met all the requirements of the Viewer Study were compensated with a stipend of $75. A total of 44 respondents completed the study in its entirety.

[1] Through communication with respondents and time stamps recorded by the Web survey software, GRG was able to confirm that those who watched a re-broadcast or DVD version of the program waited the required two weeks before completing the Post-Survey.

Viewer Study with High School Students

To learn the impressions of students who experienced *Einstein's Big Idea* as part of a school-based learning experience, GRG recruited four high school teachers to administer a Pre-Viewing Survey to their students, show the NOVA program as part of their science class, and then administer a Post-Viewing Survey to students two weeks later.

The Pre- and Post-Viewing Surveys were abridged versions of those described above (see Appendix C and D, respectively). The Pre-Viewing Survey collected basic demographic information such as grade level, gender, and race, as well as information about students' exposure to science topics and activities and their attitudes about science. Students also reported the last time they had learned about $E=mc^2$, identified the terms in the equation, and reported their knowledge of six key concepts.

The Post-Viewing Survey gathered student feedback on the program. It also measured the extent to which the program encouraged students to think about its learning goals and the extent to which they learned about key topics. The survey also re-assessed students' attitudes about science, as well as their knowledge about the terms that make up $E=mc^2$ and the scientists who contributed to its creation.

A total of 52 students completed both the Pre- and Post-Viewing Survey.

EINSTEIN'S BIG IDEA WEB SITE

GRG evaluated the *Einstein's Big Idea* Web site via a Web-based survey hosted on the GRG survey Web site. Visitors to the *Einstein's Big Idea* site were alerted to the survey in a number of ways identified by GRG and WGBH to increase the presence of the survey. These included a link to the Web Survey that was placed prominently on the top of the Resource list, a message about the survey that automatically popped up after a visitor had been on the site for 20 minutes, and a notice that was included in a weekly e-newsletter sent to NOVA subscribers.

The Web Survey documented the reasons visitors came to the site, the features they used, and feedback about the site. Visitors' perceptions of what they learned from the site and the extent to which they planned to continue engaging with Einstein-related content as a result of visiting the site were also measured. See Appendix E.

GRG's Web Survey was launched in the week prior to the *Einstein's Big Idea* broadcast. One week after the broadcast, 1,544 visitors had completed the Web Survey, and the link was removed from the NOVA site.

WGBH's Final Report Survey

WGBH required each of the 20 libraries, as part of its participation as a model site, to complete a Final Report Survey. This survey asked each site to report the individual pieces of the Guide it used. It also asked for a complete description of each display the library created and each event it hosted. Further, it provided model library sites with the opportunity to make suggestions for future projects.

Libraries submitted Final Report Surveys directly to WGBH in January 2006. WGBH then sent copies of these reports to GRG to be coded and analyzed as part of the evaluation. Nineteen Final Report Surveys were submitted.

Library Patron Surveys

GRG created three patron surveys (Adult, Young Adult, and Child) for model library sites to administer after their *Einstein's Big Idea* events. Surveys were designed to gather feedback about the event and information about what was learned. Each model library site was responsible for administering surveys after at least two events. Model library sites mailed their completed surveys to GRG for data entry and analysis. Eighteen libraries submitted patron survey data to GRG.

The Adult Patron and Young Adult Patron surveys were quite similar (see Appendix F and G, respectively). Both were two pages in length and the questions on each survey were the same; however, the Young Adult Patron Survey provided different response lists and rating scales that were more appropriate for this age group. A total of 743 Adult Patron Surveys and 385 Young Adult Patron Surveys were submitted to GRG.

The Child Patron survey was one page in length (see Appendix H). Questions asked children to report whether they had fun at their library's event, the activities they did at their event, and their favorite part of the event. Demographic information, such as age, gender, and race, was also collected. A total of 888 Child Patron Surveys were collected by model library sites.

In total, model library sites reported serving 9,069 patrons through their *Einstein's Big Idea* events. Of those, 2,016 (22%) completed a Patron Survey.

National Library Tracking Sheets

In addition to the 20 model libraries, all public libraries across the country received a hard copy of the Guide, as well as information on where to locate the online version of the materials. Materials were distributed by direct mail and through an ALA listserve message that provided a link to the electronic version.

GRG surveyed these librarians to learn whether they had used Guide materials and/or hosted *Einstein's Big Idea* events at their library. The National Library

Tracking Sheet measured whether the library used specific Guide materials, the programs they implemented, and the audiences they served. Libraries also reported their plans to implement additional *Einstein's Big Idea* events in the future. See Appendix I.

ALA sent an invitation to complete the Tracking Sheet to librarians and staff on five listserves. Email invitations were sent on two occasions, once in November and once in December. A total of 99 librarians completed the National Library Tracking Sheet during this two-month period.

REPORT ORGANIZATION

The purpose of this report is to present findings from GRG's evaluation. Results are organized by chapters, with one chapter devoted to each evaluation component. In order for the reader to compare findings across chapters, GRG has used a similar presentation style throughout to report results from similar questions.[2] Final results and related conclusions are presented in each chapter. The report concludes with a section that summarizes findings from across evaluation components and presents GRG's recommendations for future programming.

[2] Note that these questions were not always worded in the exact same way across surveys; there were minor differences in phrasing and the scales used across instruments. For ease of presentation, GRG selected the most common phrasing to use conventionally throughout the report.

CHAPTER ONE: THE *EINSTEIN'S BIG IDEA* NOVA PROGRAM

Following are the results of the summative evaluation of the *Einstein's Big Idea* program. This chapter is broken into two large sections. The first focuses on the Viewer Study with regular NOVA viewers. The second presents results from the High School Viewer Study.

VIEWER STUDY WITH REGULAR NOVA VIEWERS

Profile of NOVA Viewer Respondents

As mentioned before, GRG used our Participant Database in order to recruit participants for the NOVA Viewer Study. As the evaluation of the program was designed to assess knowledge gains and attitudes toward program content, as well as viewers' attitudes toward the unique format of the show, GRG sought to recruit a sample of participants who were already regular viewers of NOVA. The term "regular viewers" was defined as those who watch NOVA once a month or more.

As seen in Table 1, more women than men participated in the NOVA Viewer Study. Most participants were between the ages of 18-49, and the majority of participants were White.

Table 1
Profile of NOVA Viewer Study Respondents

		% Respondents
Gender	Female	68%
	Male	32%
Age	18-30 years old	32%
	31-45 years old	41%
	46-60 years old	27%
Race/Ethnicity	African American	9%
	American Indian	2%
	Asian/Pacific Islander	14%
	Hispanic/Latino	9%
	White	70%

N=44

NOVA Viewer Study participants (referred to herein as NOVA viewers) also reported the highest level of education they have completed and their annual household income (see Table 2). Results indicated that most had earned a college degree or higher. Most annual household incomes were $50,000 per year or more.

Table 2
Household Income and Education Levels of NOVA Viewer Study Respondents

		% respondents
Highest Level of Education Completed	Some college/trade school	24%
	College degree	42%
	Some graduate/professional school	12%
	Graduate/professional degree	22%
Annual Household Income	Less than $30,000	9%
	Between $30,000 and $49,999	23%
	Between $50,000 and $69,999	34%
	More than $70,000	34%

Number of respondents ranged from 41-44 across questions.

NOVA viewers reported their knowledge about science and scientific discoveries on a scale from 1 (*Very Basic*) to 5 (*Very Advanced*). Using this scale, most indicated that their knowledge was *average* to *slightly advanced*.

- 5% reported that their knowledge was *very advanced*,
- 22% rated their knowledge a 4 on the scale,
- 55% reported their knowledge was average by selecting a 3, and
- 9% each reported that their knowledge was *very basic* or *basic*, ratings of 1 and 2, respectively.

Although NOVA viewers had learned about E=mc² in the past, it had been several years since they had learned or thought about the equation.

NOVA viewers were also asked to chart their most recent experiences with the formula $E=mc^2$, including the last time they learned about the formula, thought about the formula, and discussed the formula with others (see Table 3).

- Approximately two-thirds of viewers (64%) reported that it had been five years or longer since they had learned about $E=mc^2$.
- Over half (57%) reported that it had been a year or more since they thought about the equation.
- The majority of NOVA viewers had not discussed $E=mc^2$ in the past year and almost half had not discussed the formula in the past five years.

Table 3
NOVA Viewers' Experiences with $E=mc^2$ Prior to the Viewer Study

	Never	10+ Years Ago	5-10 Years Ago	1-5 Years Ago	Months Ago	Weeks Ago	This Week
When was the last time you:							
learned about the formula $E=mc^2$?	5%	40%	18%	27%	5%	5%	0%
thought about the formula $E=mc^2$?	9%	18%	9%	21%	27%	9%	7%
discussed the formula $E=mc^2$?	7%	21%	18%	18%	16%	11%	9%

N=44

In addition to reporting their knowledge of science and recent exposure to $E=mc^2$, NOVA viewers selected, from a list of options, the resource they use most often to learn about the latest advances in science.

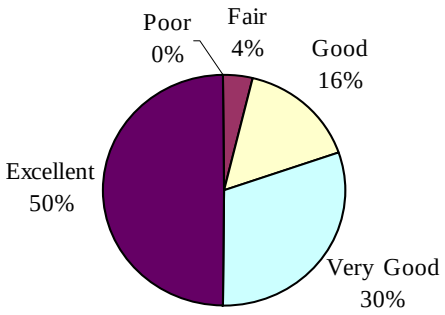
- The largest group of NOVA viewers (30%) reported using science documentaries as their resource for information about advancements in science.

- 18% get this information from an online news source,
- 16% reported getting this information most often from a national news broadcast,
- 14% reported that they rely on a science-based Web site to learn about the latest advances in science

NOVA Viewers' Feedback about *Einstein's Big Idea*

NOVA Viewer Study participants were asked to sum up their impressions of the show using a rating scale of 1 (*Poor*) to 5 (*Excellent*). When asked to give an overall rating of the show, over three-quarters of participants rated the show as *very good* or *excellent.* See Figure 1.

Figure 1
NOVA Viewers' Rating of *Einstein's Big Idea*



80% of NOVA viewers rated Einstein's Big Idea as very good or excellent, and most indicated that the docudrama format was either very or extremely appealing.

Viewers' positive feedback about the show was also evident when they were asked if they had recommended the NOVA program to others. Two weeks after watching *Einstein's Big Idea*, 80% had already recommended the show to someone.

NOVA Viewers' Impressions of the Program's Format

Einstein's Big Idea differs from typical NOVA programming in that it is a docudrama that presents content through dramatized stories rather than through a more traditional documentary format. NOVA viewers rated the appeal of this format on a scale from 1 (*Not at All*) to 5 (*Extremely*). Results indicated that viewers found this format *very* to *extremely appealing* on average (mean rating = 4.16).

- Almost half (48%) of the NOVA viewers found the format of *Einstein's Big Idea extremely appealing*.
- 27% found the format *very appealing,*
- 21% rated it as s*omewhat appealing,* and

- 2% each felt that the format was either *a little* or *not at all appealing*.

The appeal of this format was confirmed when participants were asked whether they would recommend that PBS produce other scientific biographies like *Einstein's Big Idea*. An overwhelming majority of participants (93%) responded in the affirmative. When asked to explain why they wanted additional programs like *Einstein's Big Idea*, NOVA viewers responded:

> *It personalized science, and it made you realize the cost to individual scientists to pursue their work. This is a great teaching tool.*
>
> *It was interesting and easy to understand.* [It was also] *appealing to those who like a little drama with their education.*
>
> *I thought this was an engaging, interesting format. It was almost like watching a movie, but with commentary from modern-day scientists who helped us to understand the impact of the discovery just shown to us by the actors.*
>
> *This biography was very interesting and informative. I think that it would be great to learn more about other great scientists.*

Impressions of Program Content

Feedback about the content of *Einstein's Big Idea* was measured through a series four questions.

Almost all NOVA viewers believed that WGBH should produce docudramas in the future; they felt the program was very to extremely successful at sustaining their interest.

First, participants reported how successful the program was at sustaining their interest on a scale of 1 (*Not at All*) to 5 (*Extremely*). Average ratings were 4.27 out of 5. The breakdown of responses was as follows:

- 57% of respondents reported that the program was *extremely successful* at sustaining their interest,
- 25% reported that the program was *very successful* in this regard,
- 9% felt the program was *somewhat successful* at sustaining their interest,
- 7% felt the program was *a little successful*, and
- 2% reported that it was *not at all successful* at sustaining their interest in the program.

NOVA viewers were also asked to state, in their own words, the scientist featured in the program that interested them the most and why. Responses confirmed the overall interest in the scientists featured, with several scientists receiving multiple nominations as the most interesting. The scientists who received the most nominations are presented in Table 4, along with a sample of participants' explanations.

Table 4
NOVA Viewers' Picks for the Most Interesting Scientists Featured in *Einstein's Big Idea*

Lise Meitner (n=11)	*Lise Meitner – She was a very strong, hard working woman. She never seemed to give up on her work, even when the other guy took the pride of winning the prize for her work.* *Lise Meitner – I have never heard of her before, and I have never realized how much she contributed to the atom nucleus splitting.* *Lise Meitner. I find her intriguing because she was a very intelligent woman who made the discovery that would change the world. Her story of splitting the atom and receiving no recognition and being exiled was heartbreaking.*
Michael Faraday (n=9)	*Faraday, because of his struggles against class bias.* *Faraday – found his ideas and perseverance to be interesting.* *Faraday – liked the energy aspects.*
Emilie du Chatelet (n=8)	*Emilie du Chatelet – her personal life was fascinating, as was her independence during a time when feminism was unheard of.* *Emilie du Chatelet because she was a brilliant lady of her time.* [She] *discovered energy* [has] *mass just in time for Einstein.* *Emilie du Chatelet. She questioned a law that was never questioned and was a female in a man's world at the time.*

NOVA viewers also reported the extent to which *Einstein's Big Idea* was effective at going beyond science to explore critical social, political and cultural issues of the last four centuries. Using the same scale reported above:

- 52% rated the program as *extremely effective* at going beyond science to explore critical issues,
- 30% felt *Einstein's Big Idea* was *very effective* at exploring these ideas,
- 13% reported that the show was *somewhat effective*, and
- 5% reported that the show was *a little effective* as going beyond science to explore critical issues.

Finally, respondents were asked to describe how difficult it was to understand the scientific concepts (i.e., energy, mass, speed of light, etc.) presented in the show. Ratings were made on a scale from 1 (*Very Difficult to Understand*) to 5 (*Very Easy to Understand*). The majority of NOVA viewers reported that the program was either *fairly easy* or *very easy to understand*. Responses were as follows:

- 30% of participants rated the program as *very easy to understand*.
- 39% felt that it was *fairly easy to understand*,
- 11% rated the program as *neither easy nor difficult to understand*,
- 18% felt it was *somewhat difficult to understand*, and
- 2% rated the program as *very difficult to understand*.

Respondents who reported that the program was either *somewhat* or *very difficult to understand* (n=9) were asked to cite the primary reason from a list of three options including the format, script, and content. When presented with these options:

- 5 NOVA viewers indicated that they found the content difficult to understand
- 2 felt the script was difficult to understand, and
- 1 indicated it was the format.
- The final respondent said *just more scientific for the smarter person…but interesting none the le*[ss].

NOVA Viewers' Learning Associated with *Einstein's Big Idea* NOVA Program

Perceived Learning Associated With the Program

On the Pre-Viewing Survey, participants rated their knowledge of six key topics related to *Einstein's Big Idea* content (See Table 5). Knowledge was rated on a four-point scale from 1 (*Nothing*) to 4 (*A lot*).

- NOVA viewers reported having the most knowledge about Einstein and why he was famous and about the role that people from diverse backgrounds have played in scientific discovery.
- NOVA viewers were less informed about the lives of scientists across history and the history, creation, and meaning of the $E=mc^2$ equation, reporting that they knew *a little* or *some* about these topics.

Table 5
NOVA Viewers' Perceived Knowledge of Key Concepts Prior to Viewing *Einstein's Big Idea*

	Nothing 1	**A little 2**	**Some 3**	**A Lot 4**
The lives of scientists across history mean=2.55	2%	55%	30%	13%
Who Albert Einstein was and what he was most famous for mean=3.32	0%	5%	59%	36%
The different pieces that make up the $E=mc^2$ formula mean=2.61	11%	36%	32%	21%
The role of women and people from diverse cultures in science experimentation and discovery mean=3.16	2%	52%	30%	16%
The relevance of $E=mc^2$ to life today mean=2.45	11%	44%	34%	11%
The history of how Einstein created $E=mc^2$ mean=2.20	23%	48%	16%	13%

N=44

Two weeks after watching *Einstein's Big Idea*, NOVA viewers were asked to rate the extent to which they had learned more about each of the above topics. Perceived learning was rated on a four-point scale from 1 (*None*) to 4 (*A great deal*). The amount that NOVA viewers reported learning did not vary based on how they rated their knowledge of topics prior to watching the program. Regardless of their prior knowledge, viewers reported learning *some* to *a great deal* about each key concept. See Table 6.

Table 6
NOVA Viewers' Self-Reported Learning about Key Concepts as a Result of Watching *Einstein's Big Idea*

	None 1	A little 2	Some 3	A Great Deal 4
The lives of scientists across history mean=3.70	0%	2%	25%	73%
Who Albert Einstein was and what he was most famous for mean=3.68	0%	4%	23%	73%
The different pieces that make up the $E=mc^2$ formula mean=3.82	0%	0%	18%	82%
The role of women and people from diverse cultures in science experimentation and discovery mean=3.75	0%	2%	21%	77%
The relevance of $E=mc^2$ to life today mean=3.36	0%	18%	27%	55%
The history of how Einstein created $E=mc^2$ mean=3.73	0%	7%	14%	79%

N=44

NOVA viewers reported learning about each of six key concepts as a result of watching Einstein's Big Idea.

Respondents were also asked to rate the extent to which the television program made them think more about the program's four learning goals, on a four-point scale from 1 (*Not at all*) to 4 (*A great deal*). As seen in Table 7:

- The program was most effective at encouraging NOVA viewers to think more about the people from different backgrounds who have contributed to scientific discovery.
- The program was also effective at encouraging NOVA viewers to think about the remaining three learning goals, with viewers reporting that they thought about these topics *some* to *a great deal* on average.

Table 7
The Extent to Which *Einstein's Big Idea* Encouraged NOVA Viewers to Think More about Learning Goals

	None 1	A little 2	Some 3	A Great Deal 4
Science is a creative process of human discovery mean=3.66	2%	2%	23%	73%
People of many different backgrounds have contributed to science mean=3.93	0%	0%	7%	93%
Science impacts almost every aspect of our lives mean=3.66	2%	0%	27%	71%
Scientific advances often bring about ethical dilemmas mean=3.59	2%	9%	16%	73%

N=44

As a final measure of the knowledge gained from watching *Einstein's Big Idea*, NOVA viewers were given the opportunity to describe one thing that they had learned. GRG coded responses to this question based on four general topics. Over half of the participants reported learning about the scientists who contributed to the equation (36%) or about Einstein's life and work (30%). A small group reported learning about the different aspects of the equation (9%) or about electromagnetism (5%). Responses included:

Einstein's "big idea" was based upon the breakthroughs [and] *accomplishments of many men and women scientists that preceded him.*

The history behind the making of the E=mc^2 and how many non-traditional scientists (female and poor) helped developed it.

I learned the history of the discovery of electro-magnetic field.

I learned about Einstein's fascination with light.

I really didn't have much background knowledge about Einstein. I was surprised to learn he was stuck in a meaningless job.

NOVA viewers' ability to identify the terms that make up E=mc^2 increased significantly as a result of watching Einstein's Big Idea.

Assessment of Knowledge Gained as a Result of Watching Einstein's Big Idea

NOVA viewers were asked to label three pieces of the E=mc^2 formula, both before and two weeks after watching *Einstein's Big Idea*. GRG used a series of paired-samples t tests to investigate the extent to which viewers' ability to label these terms increased after watching the show. As seen in Table 8, NOVA viewers' ability to identify the terms M and C, and their ability to identify all three terms overall, increased at a statistically significant level.

Table 8
NOVA Viewers' Ability to Label the Terms in E=mc^2 Before and After Watching *Einstein's Big Idea*

	Before Watching *Einstein's Big Idea*	**After Watching *Einstein's Big Idea***
E stands for Energy	84%	95%
M stands for Mass	77%	95%*
C stands for the Speed of Light	56%	86%**
Total # Correct (out of 3)	2.16	2.77**

N=44; *p<.05, **p<.01

Einstein's Big Idea was effective at teaching NOVA viewers about the different scientists who contributed to the creation of E=mc^2.

NOVA viewers' increased knowledge about scientists other than Einstein who contributed to the creation of the E=mc^2 equation was also assessed. Prior to watching the NOVA program, five of the 44 respondents (11%) believed they could name a scientist related to the creation of the famous formula. After watching the program, over half of the NOVA viewers could correctly describe the scientific contributions of four different scientists who each contributed to E=mc^2.

- 73% wrote that Lise Meitner *split the atom's nucleus to release energy* and was *the mother of the atomic bomb*.
- 71% recalled that Michael Faraday *discovered electromagnetism* and *provided a definition for energy*.
- 70% knew that Emilie du Chatelet was a *mathematician* who *did experiments with weights and distances traveled* and was *the woman who proved Isaac Newton wrong.*

- 55% wrote that Lavoisier was responsible for the discovery of the *conservation of mass*

The Einstein's Big Idea program motivated viewers to continue learning more about Einstein and other related content.

Longer-Term Science Engagement Associated with *Einstein's Big Idea*

NOVA Viewer Study participants were presented with a list of eight ways in which they could extend their engagement with *Einstein's Big Idea* content and were asked to select those activities they had completed, planned to complete, or had no plans to complete. See Table 9.

Two weeks after watching the program, half of the participants had already completed at least one of the eight activities on the list, and an additional 46% indicated that they had not yet completed an activity but planned to in the future. Of those who had completed activities,

- Most (84%) had discussed what they learned from the show with others.
- Just under half had visited the *Einstein's Big Idea* website or engaged in other activities to learn more about Einstein.
- Approximately one-third had sought out additional information about the other scientists who contributed to $E=mc^2$ or about other scientific discoveries.

Table 9
NOVA Viewers' Engagement in Einstein-related Activities Since Watching *Einstein's Big Idea*

	Have Done This Already	Plan to Do This	Do Not Plan to Do This
Discussed what you have learned with others	84%	14%	2%
Visited the *Einstein's Big Idea* Web Site	45%	48%	7%
Learned more about Einstein	43%	52%	5%
Learned more about the scientists who contributed to $E=mc^2$	36%	48%	16%
Sought out more information about important scientific discoveries generally	34%	52%	14%
Learned more about modern-day scientific research resulting from $E=mc^2$	18%	61%	21%
Sought out other science events (for example, lectures or book clubs)	16%	59%	25%
Read the book by David Bodanis on which the show was based	7%	61%	32%

N=44

VIEWER STUDY WITH HIGH SCHOOL STUDENTS

Profile of Respondents

A total of 52 students participated in the Student Viewer Study. More boys than girls participated. Most students were between the ages of 15 and 18 and identified themselves as White (see Table 10).

Table 10
Profile of High School Viewer Study Respondents

		% Respondents
Gender	Female	33%
	Male	67%
Age	13-14 years old	2%
	15-16 years old	55%
	17-18 years old	41%
	19 years old	2%
Race/Ethnicity	African American	2%
	American Indian	4%
	Asian/Pacific Islander	4%
	Hispanic/Latino	15%
	White	79%

Number of respondents ranged from 51-52 across questions.

High school students reported their attitudes about science by rating four questions on a scale of 1 (*Strongly Disagree*) to 5 (*Strongly Agree*). As seen in Table 11, students had favorable ideas about science. Most reported that they like science, and over half reported that they are good at science. Most also reported that they enjoy science and disagreed with the statement *science is boring*.

Table 11
High School Students' Attitudes about Science

		Slightly Disagree 1	Disagree 2	Not Sure 3	Agree 4	Slightly Agree 5
I like science.	mean=3.79	6%	8%	17%	40%	29%
I enjoy learning science.	mean=3.67	8%	13%	13%	35%	31%
Science is boring.	mean=2.15	38%	27%	19%	12%	4%
I am good in science.	mean=3.58	6%	6%	29%	44%	15%

N=52

In addition to reporting their science attitudes, students also provided information about their science-related behavior (see Table 12). Most students reported *occasionally* watching science television programs and most reported reading science-related books or magazines and talking with others about science *rarely* or *occasionally*. Of the four options presented, students were least likely to visit science Web sites, with most reporting that they *never* or *rarely* visit these sites.

Table 12
Students' Exposure to Science

	Never 1	Rarely 2	Occasionally 3	Fairly Often 4	Very Often 5
Watch shows about science on television at home mean=3.06	6%	23%	38%	25%	8%
Visit Web sites about science. mean=2.12	34%	31%	25%	8%	2%
Read books or magazines about science. mean=2.38	21%	38%	27%	8%	6%
Talk with people about science. mean=2.90	10%	32%	25%	23%	10%

N=52

Student viewers were rarely or occasionally involved with science content outside of the classroom.

In a series of follow-up questions, GRG asked students to list the science programs they watch and/or the science-related books or magazines they read. Of the students who responded to these questions,

- Most of those who watch science programs reported watching the Discovery Channel. Others reported watching Bill Nye the Science Guy, Animal Planet, or prime time television programs that feature characters employed in fields that use science (such as CSI, House, and Grey's Anatomy). Three students reported watching NOVA.
- Few students listed a science-related book, and those who did seemed to list them by topic rather than title. Marine biology, astronomy, and theorizing of species were mentioned.
- Popular Science, Popular Mechanics, National Geographic, and Discover were each mentioned as the science-related magazines that students read. One or two students also mentioned Science and Scientific American.

Finally, students also reported on their experience with learning about the $E=mc^2$ equation. Many students (43%) had never learned about the equation and many others (35%) reported that they had not learned about it in years. The remaining students (22%) reported that they had learned about the equation in recent months or weeks.

Students' Feedback about *Einstein's Big Idea*

The first question on the Post-Viewing Survey asked students to provide their first impressions of the *Einstein's Big Idea* program. Most students took this opportunity to provide feedback about the show, with 55% providing positive feedback and 19% providing negative feedback. Others chose to describe their expectations of the film before watching it (15%) or summarized some of the film's content (11%). Responses included:

> *The Einstein's Big Idea show was interesting and educational.*
>
> *The movie just got better the farther it ran. Very inventive movie with good representations of the history.*

It wasn't as good as it could have been. It presented more historical information than science information.

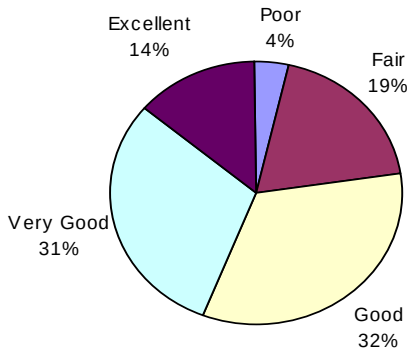
[I thought] *it would be more about the creation of* $E=mc^2$ *than Einstein himself.*

Talked something about the life of Albert Einstein. Had something to do with science.

Student viewers rated Einstein's Big Idea favorably, with most rating it as good or very good. Most rated the program as somewhat to very appealing.

After providing their first impression, students were given the opportunity to rate the program using a five-point scale of 1 (*Poor*) to 5 (*Excellent*). Feedback on the program was positive, with almost two-thirds of students rating the show as *good* or *very good*. See Figure 2.

Figure 2
Student Ratings of *Einstein's Big Idea*



Student Impressions of the Program's Format and Content

After rating the program overall, students were asked to rate the extent to which they found the docudrama format of the show appealing. Ratings were made on a scale of 1 (*Not at All*) to 5 (*Extremely*). Overall, students found the presentation format appealing.

- 6% reported that the docudrama format was *extremely appealing*,
- 33% found it *very appealing*,
- 49% thought it was *somewhat appealing*,
- 4% thought it was *a little appealing*, and
- 8% found the docudrama presentation format to be *not at all appealing*.

Students also rated how easy or difficult it was to understand the concepts presented in the *Einstein's Big Idea* NOVA program. Using a four-point scale of 1 (*Very Difficult*) to 4 (*Very Easy*), most students reported that the concepts were *fairly easy* to understand. Similar numbers of students found the concepts *somewhat difficult* (21%) and *very easy* (19%) to understand and a small percentage of students found the concepts *very difficult* (6%) to understand.

Student Learning Associated with *Einstein's Big Idea* NOVA Program

Students' Perceived Learning Associated with the Program

As on the NOVA Viewer Survey, student viewers were asked to rate their knowledge about each of six key concepts on a scale of 1 (*None*) to 4 (*A Lot*), prior to watching *Einstein's Big Idea*. Students rated their knowledge of the six concepts lower than did NOVA viewers. Students believed they knew the most about who Einstein was and why he was famous, and they reported knowing between *nothing* and *a little* about each of the other five concepts, on average. See Table 13.

Table 13
Students' Perceived Knowledge of Key Concepts Prior to Viewing *Einstein's Big Idea*

	Nothing 1	**A little 2**	**Some 3**	**A Lot 4**
The lives of scientists across history mean=1.96	29%	46%	25%	0%
Who Albert Einstein was and what he was most famous for mean=2.96	0%	27%	50%	23%
The different pieces that make up the $E=mc^2$ formula mean=1.73	48%	33%	17%	2%
The role of women and people from diverse cultures in science experimentation and discovery mean=1.82	39%	39%	22%	0%
The relevance of $E=mc^2$ to life today mean=1.63	55%	27%	18%	0%
The history of how Einstein created $E=mc^2$ mean=1.78	43%	37%	18%	2%

Number of respondents ranged from 51-52 across questions.

Student viewers reported knowing nothing to a little about each of the key concepts of the program prior to watching Einstein's Big Idea; afterwards, most reported learning some to a great deal about each concept from watching the show.

Two weeks after watching *Einstein's Big Idea* as part of their science class, students rated the extent to which they learned about the program's key concepts. In addition to reporting that they knew less about the key concepts than NOVA viewers prior to watching the program, students also reported learning less than NOVA viewers as a result of watching *Einstein's Big Idea* than did NOVA viewers. As seen in Table 14:

- Over three-quarters of students reported learning *some* or *a great deal* about who Einstein was and why he was famous, the pieces that make up the $E=mc^2$ equation, and the history of how Einstein created the equation.
- Approximately two-thirds reported learning *some* or *a great deal* about the lives of scientists across history and the role of women and people from diverse cultures in science.
- Just under half reported learning *some* or *a great deal* about the relevance of $E=mc^2$ to life today.

Table 14
Students' Self Reported Learning about Key Concepts as a Result of Watching *Einstein's Big Idea*

	None 1	A little 2	Some 3	A Great Deal 4
The lives of scientists across history mean=2.82	8%	29%	35%	28%
Who Albert Einstein was and what he was most famous for mean=3.16	2%	14%	51%	33%
The different pieces that make up the $E=mc^2$ formula mean=3.12	11%	8%	39%	42%
The role of women and people from diverse cultures in science experimentation and discovery mean=2.80	4%	31%	45%	20%
The relevance of $E=mc^2$ to life today mean=2.55	15%	37%	24%	24%
The history of how Einstein created $E=mc^2$ mean=2.94	10%	16%	44%	30%

Number of respondents ranged from 50-52 across questions.

Students also rated the extent to which *Einstein's Big Idea* made them think more about the program's four learning goals. Ratings were made on a four-point scale from 1 (*Not at all*) to 4 (*A Great Deal*). As seen in Table 15, students believed the program encouraged them to think between *a little* to *some* about each of the four learning goals, on average.

Table 15
The Extent to Which *Einstein's Big Idea* Encouraged Students to Think More about Learning Goals

	None 1	A little 2	Some 3	A Great Deal 4
Science is a creative process of human discovery mean=2.84	10%	16%	55%	19%
People of many different backgrounds have contributed to science mean=2.84	10%	20%	46%	24%
Science impacts almost every aspect of our lives mean=2.96	2%	31%	36%	31%
Scientific advances often bring about ethical dilemmas mean=2.63	10%	31%	45%	14%

Number of respondents ranged from 50-52 across questions.

Assessment of Knowledge Gained as a Result of Watching Einstein's Big Idea

Student viewers' ability to identify terms in the equation $E=mc^2$ increased at a statistically significant level after watching Einstein's Big Idea.

Students viewers were asked label E, M, and C from the $E=mc^2$ equation before and after watching *Einstein's Big Idea*. Students' responses confirmed that many had not learned about the equation recently; approximately half correctly labeled E and M prior to watching the program and only one fifth correctly labeled C. As seen in Table 16, the vast majority of students correctly labeled each of the three terms after watching *Einstein's Big Idea*. The percentage of students who correctly identified each term and students' overall increase in the total number of terms identified correctly all increased at a statistically significant level.

Table 16
Students' Ability to Label the Terms in $E=mc^2$ Before and After Watching *Einstein's Big Idea*

	Before Watching *Einstein's Big Idea*	**After Watching *Einstein's Big Idea***
E stands for Energy	51%	96%**
M stands for Mass	45%	90%**
C stands for the Speed of Light	22%	83%**
Total # Correct (out of 3)	1.13	2.67**

Number of respondents ranged from 46-49 across questions.
*p<.05, **p<.01

Einstein's Big Idea was effective at increasing students' knowledge about the other scientists who contributed to the creation of $E=mc^2$.

Students' knowledge of the scientists who contributed to the creation of $E=mc^2$ also increased as a result of watching *Einstein's Big Idea*. Prior to watching the program, students were asked to name scientists, other than Einstein, who contributed to the creation of the equation. Only one student out of 52 (2%) provided a response. This student wrote Michael Ferret and may have been thinking of Michael Faraday.

Two weeks after watching the program, students were asked to write one sentence to describe four of the scientists featured. More than one-quarter of students could identify the contribution of each of the four scientists after watching the program.

- 39% recalled that Michael Faraday *discovered that energy doesn't travel in straight lines* or that he *discovered the electromagnetic pulse,*
- 35% wrote that Antoine Lavoisier discovered *that mass is never lost,*
- 34% wrote that Lise Meitner *split the atom,*
- 27% recalled that Emilie du Chatelet *changed Newton's theory* and confirmed that *the speed of light should be squared.*

Finally, students were asked to name one modern-day invention that was created using $E=mc^2$. Students responded to this question both before and after watching *Einstein's Big Idea*. The most common response to this question was the atomic bomb. Prior to watching the program, 13% of students provided this response. After watching, the number of students who knew that the atomic bomb was a result of $E=mc^2$ was 38%, a statistically significant increase (p<.01).

A sub-set of students reported plans to seek out additional experiences to extend their engagement with content related to Einstein's Big Idea.

Longer-Term Science Engagement Associated with *Einstein's Big Idea*

Student participants reported on their plans to extend their engagement with *Einstein's Big Idea* content by selecting activities they would, would not, or might complete, from a list of three activities.

As seen in Table 17, fewer than one-quarter of student viewers planned to complete each of the three activities, and a similar percentage reported that they might complete each. Half of the students reported that they did not plan to complete each of the three activities.

Table 17
Students' Plans to Engage in Einstein-Related Activities

	Yes	No	Not Sure
Visit the *Einstein's Big Idea* Web site	16%	56%	28%
Learn more about Einstein and the issues raised in the show	24%	48%	28%
Talk with people about the show	22%	56%	22%

N=50

CONCLUSIONS

The *Einstein's Big Idea* NOVA program content was a good fit for the target audience in that it reinforced and expanded upon viewers' experiences with content related to $E=mc^2$.

While many NOVA viewers and students had prior experience learning about and/or discussing Einstein and his famous formula, most had not engaged in these activities in years. Further, NOVA viewers reported having a moderate knowledge of the key concepts explored in the program prior to watching, and few could name one scientist other than Einstein who was associated with the equation. Students had less knowledge than adults in both of these areas. As such, *Einstein's Big Idea* built on viewer's prior experiences to provide content to its audience.

Einstein's Big Idea appealed to viewers.

The vast majority of NOVA viewer participants rated the program as *very good* or *excellent*, and most had already recommended the program to others two weeks after watching it themselves. Students also rated the program positively, indicating it was *good* or *very good*. Both audiences also reported that the docudrama presentation format was appealing, and when asked, NOVA viewers recommended that WGBH use this format for future NOVA productions.

Viewers learned new information about the $E=mc^2$ formula as a result of watching *Einstein's Big Idea*.

Regardless of how much NOVA viewers knew about key concepts prior to watching the program, they reported learning *some* to *a great deal* from the show. Both NOVA viewers and students' ability to label the terms that make up the equation increased at a statistically significant level after watching the program. Finally, NOVA viewers' ability to describe the specific contributions of scientists, other than Einstein, who contributed to $E=mc^2$ also increased after watching *Einstein's Big Idea* and student viewers also showed increased knowledge in this area to a lesser extent.

The program was particularly effective at highlighting scientists other than Einstein who are associated with $E=mc^2$.

Of the four learning goals of the program, NOVA viewers reported that it was the most effective at provoking thought about the role of women and other "outsiders" in science. These reports were confirmed by NOVA viewers' open-ended responses about what they learned from watching *Einstein's Big Idea*, with the largest group of responses focusing on having a deeper understanding of the multiple scientists whose work contributed to the famous equation.

***Einstein's Big Idea* encouraged NOVA viewers, and students to a lesser extent, to continue engaging with science content or activities related to the show.**

Two weeks after watching the NOVA program, half of the NOVA viewer participants had already taken steps to continue engaging with content related to *Einstein's Big Idea*, and almost all remaining participants had plans to complete similar activities. Most had discussed *Einstein's Big Idea* with others, and many had visited the program's accompanying Web site or taken other steps to learn more about Einstein. Viewers also reported an interest in continuing to learn more about the other scientists featured in the program and the equation itself, including its modern-day uses. Student viewers were less influenced by the program in this way, with approximately one-quarter indicating that they intended to continue engaging with the show's content.

CHAPTER TWO: *EINSTEIN'S BIG IDEA* WEB SITE SURVEY

PROFILE OF RESPONDENTS

A total of 1,544 people completed the *Einstein's Big Idea* Web Survey. The majority of Web site visitors were male, aged 31-45, and White (see Table 1).

Table 1
A Description of Visitors to the *Einstein's Big Idea* Web Site

		% Respondents
Gender	Female	25%
	Male	75%
Age	< 18 years old	3%
	18-30 years old	12%
	31-45 years old	46%
	46-60 years old	29%
	61-75 years old	9%
	76 and older	1%
Race/Ethnicity	African American	2%
	American Indian	2%
	Asian/Pacific Islander	6%
	Hispanic	5%
	Native Hawaiian/Pacific Islander	1%
	White	83%

N=1,544

Visitors to the *Einstein's Big Idea* Web site were regular science television viewers, with over half reporting that they watch science programming on a weekly basis and over three-quarters (87%) watching at least once a month.

- 61% reported watching science programs on television *once a week or more*,
- 16% reported watching *a few times a month*,
- 10% reported watching *once a month*,
- 12% watch science programs *a few times a year*,
- Fewer than 1% each reported that they watch science program *once a year* or *never*.

The Einstein's Big Idea Web site attracted both regular and new NOVA Web site visitors.

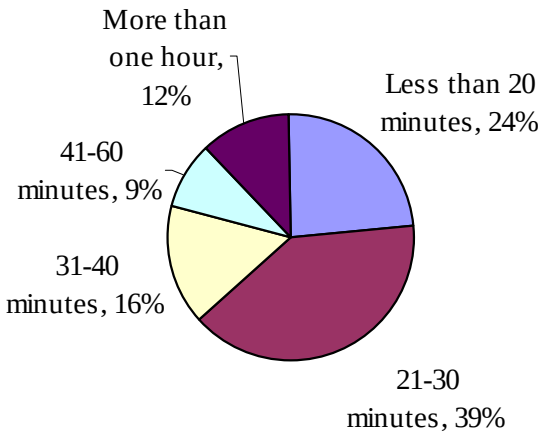
A large group of *Einstein's Big Idea* visitors reported that they frequent NOVA Web sites a few times a year, but over one-quarter reported that *Einstein's Big Idea* was the first NOVA site they had ever visited.

- 9% each reported visiting a NOVA Web site *once a week or more, a few times a month*, and *once a month*,
- 43% visit NOVA sites *a few times a year*,
- 2% visit NOVA sites *once a year*, and
- 28% were visiting a NOVA site for the *first time*.

USE OF THE *EINSTEIN'S BIG IDEA* WEB SITE

Three-quarters of Web Survey respondents spent 20 minutes or more visiting the *Einstein's Big Idea* site. As seen in Figure 1, most respondents spent between 21-30 minutes on the site, and about one-fifth spent 41 minutes or more visiting *Einstein's Big Idea*.

Figure 1
Amount of Time that Visitors Spent on the *Einstein's Big Idea* Web Site



Use of the *Einstein's Big Idea* Web site is described further below based on the reasons respondents visited the site, the specific features visited, and the perceived navigability of the site.

Most Web site visitors came to the Einstein's Big Idea site to learn more about the equation, $E=mc^2$.

Reasons for Visiting the *Einstein's Big Idea* Web Site

Web Survey respondents were asked to select, from a list of eight options, the reasons they visited the *Einstein's Big Idea* Web site (see Table 2). Visitors reported two to three reasons for visiting the site, on average.

- Most (62%) reported coming to the site to learn more about the equation $E=mc^2$ and just under half came to learn about Einstein's other scientific discoveries.
- Approximately one-third wanted to get information about the program's broadcast, learn more about other scientists who contributed to the equation, or learn about Einstein personally.

Table 2
Reasons for Visiting the *Einstein's Big Idea* Web Site

	% respondents
To learn more about the equation $E=mc^2$	62%
To learn more about Einstein's scientific discoveries	46%
To get information on the PBS program broadcast on October 11	36%
To learn more about other important scientists who contributed to Einstein's scientific discoveries	36%
To learn more about Einstein personally	31%
To be able to provide more information about the program to others	10%
To learn more about how the show was produced	3%
I was just browsing the Web	2%

N=1,094

Specific Features Visited

The features on the *Einstein's Big Idea* Web site were organized into three categories: *Inquiry & Articles*; *Interactives, Audio & More*; and *Resources*. GRG analyzed the features visited based on these organizational categories.

Web site visitors spent the most time reviewing the Inquiry & Articles section of the site. Over half also used the $E=mc^2$ audio feature.

Of the three sections, *Inquiry & Articles* was visited most often, with 86% of Web Survey respondents reporting that they visited at least one feature from this section. Respondents visited an average of two to three features. Over half of the respondents visited *The Legacy of $E=mc^2$*; four in ten visited *The Theory Behind the Equation* and *Genius among Geniuses* (see Table 3).

Table 3
Inquiry & Articles Features Visited by Web Survey Respondents

	% respondents
The Legacy of $E=mc^2$	66%
The Theory Behind the Equation	40%
Genius among Geniuses	40%
The Equation Today	24%
Relativity and the Cosmos	17%
Einstein the Nobody	15%
The Producer's Story	8%

N=1,461

The majority of Web Survey respondents (72%) also visited at least one feature from the *Interactives, Audi, & More* section. On average, one or two features from this section were viewed. As seen in Table 4, the feature visited most often from this section of the site was *$E=mc^2$ Explained*.

Table 4
Web Survey Respondents Who Visited *Interactives, Audio & More*

	% respondents
$E=mc^2$ Explained	56%
Einstein Quotes	25%
The Power of Tiny Things	24%
Ancestors of $E=mc^2$	23%
Time Traveler	21%
The Light Stuff	15%
Einstein Time Line	14%

N=1,469

At least one feature from the *Resources* section of the Web site was viewed by 45% of respondents. As seen in Table 5, the *Teacher's Guide* was the feature used most from this section.

Table 5
Resources Features Visited by Web Survey Respondents

	% respondents
Teacher's Guide	28%
Links & Books	7%
TV Program Description	6%
Program Transcript	6%
Buy the Video/DVD	5%
Library Resource Kit	2%
Credits	2%

N=1,469

The Einstein's Big Idea Web site was considered very easy to navigate and visitors reported that they were able to find most or all of the information they wanted.

Perceived Navigability of the Web Site

Regarding their general ability to navigate the *Einstein's Big Idea* Web site, respondents reported whether they could find the information they were looking for on the site. Using a five-point scale from 1 (*Not at All*) to 5 (*All of It*), respondents reported the extent to which they were able to find the information they wanted.

- 58% reported that they were able to find *all* of the information they were looking for,
- 14% reported that they were able to find *almost all* of the information they wanted,
- 20% found *most* of what they wanted,
- 6% found *a little* of what they wanted, and
- 2% reported that they could not find what they wanted *at all*.

Respondents were also given the opportunity to list the information they were looking for but could not find. The top two answers provided focused on the desire for additional information or clarification about the $E=mc^2$ equation and/or

science concepts related to the equation, as well as information on the other scientists featured in the NOVA program. Specifically, people wanted to find information about:

I would have liked to see the derivation of $E=mc^2$

How is the speed of light measured?

A clear explanation of time dilation

Detailed information about neutrinos, gravitons, and tachyons

Was looking for a simplified explanation of electricity vs. magnetism

I thought I could find detailed pages of all the other scientists.

The extent to which respondents found it easy or difficult to navigate the Web site was also rated. Using a four-point scale of 1 (*Very Difficult*) to 4 (*Very Easy*), almost all respondents reported that it was easy to navigate *Einstein's Big Idea*.

- 89% reported that it was *very easy* to navigate,
- 10% reported that it was *somewhat easy*,
- 1% reported that it was *somewhat difficult*, and
- Fewer than 1% of respondents reported it was *very difficult* to navigate the *Einstein's Big Idea* Web site.

99% of viewers reported being satisfied with the Web site, and the majority reported they would recommend the site to others.

FEEDBACK ON THE WEB SITE

Respondents rated their overall satisfaction with the quality of the Web site using a scale of 1 (*Not at All*) to 5 (*Extremely*). The overwhelming majority of visitors reported they were *very* or *extremely satisfied*.

- Over half of the respondents (58%) indicated that they were *extremely satisfied* with the site,
- 35% were *very satisfied*,
- 5% were *somewhat satisfied*, and
- Fewer than 1% each reported that they were either *a little* or *not at all satisfied* with the site.

Respondents' positive impressions were expressed further when asked if they would visit again and whether they would recommend the site to others; 88% reported that they would visit *Einstein's Big Idea* again and 84% said they would recommend it.

In addition to their overall impressions of the site, respondents were also given the opportunity to select their favorite Web site feature. A total of 760 respondents provided feedback about their favorite part of the site. GRG coded responses based on both the feature names and other general categories, as applicable.

Overall, respondents selected a wide range of features as their favorite. Every feature from both the *Inquiry &Articles* and *Interactives, Audio & More* sections

was selected as a favorite by at least small group of respondents. The Teacher's Guide and the Program Transcripts from the *Resources* section were also each chosen as favorites.

The features selected were not limited to those that were visited most often by respondents. Instead, those selected the most often as a favorite were those that focused on the antecedents and explanations of the $E=mc^2$ equation.

- The largest group of respondents (27%) selected *$E=mc^2$ Explained* as their favorite feature.
- 11% selected the *Ancestors of $E=mc^2$* as their favorite.
- A similar percentage of respondents selected *The Theory Behind the Equation* (9%) and *The Power of Tiny Things* (8%) or indicated that they liked all features on the site and could not pick a favorite (9%).

The final question of the survey gave respondents the opportunity to provide additional comments and/or suggestions about the Web site. A total of 494 respondents answered this question. Of those, 72% took the opportunity to provide additional positive feedback by praising the show, praising NOVA, or saying *thank you* or *keep up the good work*. Comments about the Web site included:

> *I like the ability to see and digest the information from the show. The web site is a great resource to extend the key points of the show.*
>
> *I like the excellent presentation of the site it really draws me into wanting to read everything.*
>
> *This is a fantastic website, one of the best I have come across [in] 10 years.*
>
> *Great job on the website for all levels of education. Thank you.*

An additional 13% of respondents provided suggestions or criticism of the Web site or show. A small group of these wanted additional video streaming from the Web site, including the option of seeing the whole program online. The remaining comments were not thematically consistent; several people provided suggestions for new NOVA programs and an interest in seeing future Web sites and programs that focus more on women and minority scientists. Criticisms and suggestions for future programming included:

> *Go deeper! If all that exists is ultimately energy then what is the nature of consciousness? Is consciousness a property of matter? of energy? of the Universe?*
>
> *Always 'dumb down' your info. When viewers wish to learn more you can increase the knowledge level through 'steps' on your site.*
>
> *I would like a program on Nanotechnology*
>
> *More science on origins of the universe*

Produce shows on quantum physics, string theory, etc.

You should present more programs on new Physics such as string theory and Quantum mechanics and its" weird" affects. There are [many] *more people interested than you think*

[It would] *be good to be able to download whole episodes.*

African-Americans and women in the fields of science: astronomy, cosmology, physics, mathematics, science exploration.

Web site visitors reported learning some to a great deal about each of seven key concepts

LEARNING ASSOCIATED WITH THE *EINSTEIN'S BIG IDEA* WEB SITE

Web Survey respondents reported how much they learned about seven key topics as a result of visiting the site on a scale of 1(*None*) to 4 (*A Great Deal*). As seen in Table 6, most respondents reported learning *some* or *a great deal* about each of the key topics. Mean ratings indicated that respondents learned the most about the equation $E=mc^2$, including the contributions of Einstein and others.

Table 6
Perceived Learning from the *Einstein's Big Idea* Web Site

	None 1	A little 2	Some 3	A Great Deal 4
The lives of scientists across history mean=3.15	10%	12%	32%	46%
Who Albert Einstein was and what he was most famous for mean=3.31	8%	9%	28%	55%
The different pieces that make up the $E=mc^2$ formula mean=3.49	5%	7%	22%	66%
The role of women and people from diverse cultures in science experimentation and discovery mean=3.16	11%	12%	27%	50%
The relevance of $E=mc^2$ to life today mean=3.32	6%	9%	31%	54%
The history of how other scientists contributed to the creation of $E=mc^2$ mean=3.36	7%	9%	24%	60%
The scientific process in general mean=3.05	10%	14%	36%	40%

N=1,544

Visitors also reported the extent to which they agreed with *Einstein's Big Idea's* learning goals, on a four-point scale of 1 (*Not at All*) to 4 (*A Great Deal*). Using a series of retrospective-pre questions, each visitor was asked to reflect back on how much they agreed with each statement before visiting the site and then report their level of agreement after visiting *Einstein's Big Idea*.

GRG analyzed change in respondents' attitudes about these statements using a series of paired-samples t tests. As seen in Table 7, Web site visitors reported a

statistically significant increase in their agreement with two of the three learning goal statements.

The extent to which visitors agreed with two of three learning goals increased significantly after visiting the Einstein's Big Idea Web site.

Table 7
Changes in Web Site Visitors' Attitudes about *Einstein's Big Idea's* Learning Goals

	Before Visiting the Web Site	After Visiting the Web Site
Science is a creative process of human discovery	3.75	3.89**
People from many different backgrounds have contributed to science	3.74	3.87**
Science impacts almost every aspect of our lives	3.93	3.93

N=1,544; **p<.01

PROJECTIONS FOR CONTINUING TO ENGAGE WITH *EINSTEIN'S BIG IDEA* CONTENT

GRG asked Web Survey respondents to report whether they would take part in a variety of science-related activities to continue engaging with science content as a result of visiting the Web site.

Three questions focused on the extent to which the Web site had influenced respondents' interest in the *Einstein's Big Idea* television program. First, respondents indicated the extent to which the Web site had increased their interest in watching the program on a scale of 1 (*Not at all*) to 4 (*A lot*). Two-thirds (67%) reported that their interest had increased *a lot* and another 20% reported that they were *somewhat* influenced (a rating of 3).

Most visitors reported an interest in watching the NOVA program as a result of visiting the Web site, and about half reported an interest in reading David Bodanis's book.

In two follow-up questions, respondents reported whether they planned to watch the show and whether they would recommend watching *Einstein's Big Idea* to others. Over half (57%) of respondents indicated they planned to watch the show themselves. Of those, 78% also planned to recommend the show to others.

In addition to their plans to watch the NOVA program, Web Survey respondents reported whether they had other plans to continue their engagement with NOVA- or Einstein-related content in four areas (see Table 8). Of these, the most common ways in which respondents expected to increase their engagement were by increasing their PBS/NOVA viewing (67%) and reading David Bodanis's book (48%).

Table 8
Percentage of Respondents Who Plan to Continue Engaging with NOVA- or Einstein-Related Content as Result of Visiting the Web Site

	% respondents
Watch more PBS/NOVA programs	67%
Read the book on which *Einstein's Big Idea* was based	48%
Discuss the issues raised on the Web site with friends, family, and/or colleagues	17%
Learn more about the biographies of scientists mentioned on the Web site	13%

N=977

CONCLUSIONS

The *Einstein's Big Idea* Web site was constructed well.

The majority of visitors to the Web site indicated that they were *very* or *extremely* satisfied with the site, that it was easy to navigate, and that they were able to find the information they wanted while on the site.

The Web site was appealing to visitors, with features in the *Interactives, Audio & More* section being the most appealing.

Visitors to the Web site reported that they will visit the Web site again and that they would recommend the *Einstein's Big Idea* site to others. When asked to choose their favorite feature on the Web site, three of the top four selections were from the *Interactives, Audio & More* section of the site.

There was considerable interest among Web site visitors in learning more about the $E=mc^2$ equation.

Most survey respondents reported visiting the *Einstein's Big Idea* site to learn more about $E=mc^2$. Further, the features visited most often on the site and those selected as favorite features also focused on this topic.

Web site visitors were particularly interested in the materials in the *Inquiry & Articles* section of the Web site.

A greater number of survey respondents visited the *Inquiry & Articles* section of the *Einstein's Big Idea* site, compared to the other two sections. Respondents also visited this section in more depth by viewing a greater number of individual features from this section compared to others.

The *Einstein's Big Idea* Web site attracted new visitors to NOVA Web sites.

While most visitors to the Web site reported that they were regular NOVA viewers, one quarter (25%) reported that *Einstein's Big Idea* was the first NOVA Web site they had ever visited.

The *Einstein's Big Idea Web* site was successful at increasing visitors' interest in watching the NOVA program.

Most visitors to the Web site indicated that it had increased their interest in watching the NOVA program, and the majority of those reported that they planned to recommend the program to others.

Visitors learned new information about key concepts as a result of visiting the *Einstein's Big Idea* Web site.

Visitor learning ranged from *some* to *a great deal* for each of the seven key concepts surveyed. The highest levels of learning were related to Einstein and the other scientists who contributed to $E=mc^2$, the equation itself, and the relevance of the equation to life today.

The Web site encouraged visitors to think about science.

Each of the learning goals for *Einstein's Big Idea* centered on the public's general understanding of science. After visiting the Web site, visitors' agreement with two of three learning goal statements had increased at a statistically significant level, including their belief that science is a human endeavor, a creative process, and a field that thrives on the contributions of diverse groups of people.

CHAPTER THREE: THE *EINSTEIN'S BIG IDEA* LIBRARY RESOURCE KIT

This section presents data describing the implementation of *Einstein's Big Idea* events at the 20 model library sites. Results are also presented to describe patrons' feedback about these events, as well as the extent to which the events encouraged them to think more about key concepts and engage in Einstein-related activities. The final section of this chapter presents results from the national survey of libraries who received the Guide.

MODEL LIBRARY SITES' *EINSTEIN'S BIG IDEA* EVENTS

All model library sites successfully implemented new programming and events.

Each of the 20 model library sites selected by WGBH agreed to perform a number of required tasks as part of the project. First, at least one representative from each site was required to attend a two-hour training session conducted by WGBH at the annual ALA conference during the Summer of 2005. During this meeting, sites had the chance to learn more about the *Einstein's Big Idea* program and their responsibilities as model library sites, meet key staff people from WGBH, and meet colleagues from other libraries around the country.

In the weeks leading up to the broadcast, sites were required to create one library display featuring the *Einstein's Big Idea* program and host two events focused on content related to the program. As part of these events, libraries were expected to develop partnerships with other local organizations and create publicity and PR materials to promote their events. The final requirements of the project were to complete the Final Survey Report and participate in GRG's evaluation.

Overall, model library sites were successful at meeting each of these program requirements. As seen in Table 1:

- All sites attended the ALA training, created an *Einstein's Big Idea* display, hosted two events, and worked with local partners to create new library programming.
- 18 provided their promotional materials to WGBH.
- 19 of the 20 sites completed the Final Survey Report, and 18 of 20 participated in all aspects of GRG's evaluation.

Table 1
Number of Model Sites that Met Each Project Requirement

	# model sites
Attend two-hour training session at ALA conference	20
Create an *Einstein's Big Idea* display	20
Host two events reaching at least 100 people, in total	20
Develop partnerships with local organizations	20
Create and provide WGBH with copies of promotional materials	18
Complete WGBH Final Survey Report	19
Complete all GRG evaluation activities	18

A Description of Library Events

Model library sites hosted a total of 209 Einstein's Big Idea events and served 9,069 patrons including adults, young adults, and children.

As previously described, each model site was required to host two *Einstein's Big Idea* events. Most libraries far exceeded this requirement. The 19 model libraries that completed the Final Report Survey hosted a total of 209 events from September through December 2005 and served 9,069 patrons. Of the 209 events hosted, 139 were one-time events and the remaining 70 were events offered on multiple occasions.[3]

Events were hosted in model libraries and at other locations in the community. Twelve sites hosted all of their events on site, and the remaining seven hosted events both in their library and in other locations such as local schools, colleges, and museums.

Model library sites hosted programs for patrons of all ages. All 19 sites hosted events for children, 16 hosted events for young adults, and 17 hosted events for adults.

Events included the scavenger hunt and trivia night, as described in the Guide. One or both of these events were hosted by 11 model library sites. Some implemented events based on the instructions provided, while others built on Guide suggestions to expand their event. Sample descriptions of these events are presented in Table 2.

[3] The 20th model library did not submit a final report but offered a total of 19 events (10 one-time and nine repeats) according to communication with WGBH.

Table 2
Examples of Scavenger Hunt and Trivia Night Events Hosted by Model Sites

	For the Science Scavenger Hunt teams of two were created consisting of an older and younger child. They had to find answers to Guide Book questions by searching books and posters throughout the library. Einstein-related prizes were awarded and a pizza party concluded the event.
E=mc^2 Scavenger Hunt (n=7)	*Teens competed against friends to win prizes by answering questions related to E=mc^2 by collecting information from the library's resources. The movie IQ was shown, followed by refreshments and prizes.* *For Science Scavenger Hunt librarians prepared question sheets for participants. After pizza and juice, teams worked together throughout the library to find answers to listed questions. Parents were encouraged to team up with a child for this event.*
	Trivia Night at the Science Kaffeehaus followed the event guidelines in the library guide. A physics instructor from a local community college gave a little talk about the equation and helped emcee the trivia contest. Four teams competed and everyone went home with some kind of prize. Cookies were supplied for everyone and beverages were available for purchase.
Trivia Night at the Science Kaffeehaus (n=9)	*Families and knowledgeable people of all ages had fun collaborating and quickly recalling science facts. (Speed of) light snacks were served and (non-Nobel) prizes were awarded to trivia winners. Since Einstein worked in the Swiss Patent Office, amusing patents were featured – some of which made your hair stand on end!* *Cinema Kaffeehaus included a live debut screening of Einstein's Big Idea in a coffee house setting and included an Einstein Trivia quiz that people answered based on the library's display.*

Model library sites hosted the scavenger hunt and trivia night events included in the Guide, as well as events of their own design.

Each of the 19 sites also hosted an event of its own design. Every site hosted at least two library-designed events, and some hosted up to six. GRG reviewed the events described in the Final Survey Report and coded them based on event type. Those that were used most often included a combination of hands-on science experiences accompanied by lectures or demonstrations, film screenings, book group discussions, and theatrical performances. Each is described in more detail below.

Hands on science experiences (n=14), lectures/panels (n=14), and science demonstrations (n=12) were offered by most sites. These types of events often overlapped with each other; for example, several sites hosted events that began as a lecture and then ended with a related hands-on science experience. Hands-on activities were geared slightly more toward a child audience but were offered to patrons of every age (child, young adult, and adult). Libraries also served all audiences through programs featuring lectures/panels and science demonstrations.

Nine sites hosted a screening of the *Einstein's Big Idea* program as one of their events. Six sites also showed films related to Einstein and his work to their library patrons; these screenings included feature films such as *IQ* and *Contact*, as well as other NOVA and/or PBS programs such as *Einstein's Wife* and *Einstein Revealed*. Film screenings were the only offerings that were not used

with patrons of all ages; these events were limited to young adult and adult audiences.

Eight sites hosted book group discussions of Einstein biographies and other science-related books. Several featured David Bodanis's book as a selection. Other books included *Ordinary Genius* and *Who was Albert Einstein?* for 8-12 year old audiences, *The Gadget* for teen audiences, and *Einstein 1905: The Standard of Greatness* and *A Short History of Nearly Everything* for adults. Book club discussions were focused mostly on young adult and adult audiences, but two sites hosted book clubs for children as well.

Eight sites created a dramatic or artistic presentation related to Einstein and his work. Several of these sites offered theatrical presentations about Einstein that traveled to schools and other local venues. Some dramatic/artistic presentations were designed specifically for one library audience, while others were designed for *general audiences*. Patrons of all ages were served through these event offerings. Examples include:

- *Science Magic!*, a live presentation done by a team from a local science museum, including demonstrations that seemed like magic but could be figured out by thinking scientifically.
- *The Einstein Project: A Play*, a staged reading by two actors.
- A presentation of *Einstein Alive* with Marc Spiegel. This theatrical presentation featured Einstein's life and work with songs, props, and audience participation.

Model Sites' Use of the Guide

As part of the WGBH Final Report Survey, each model library site reported the materials they used from each component of the Guide. This section presents these datad as well as model sites' feedback about specific materials. First, additional information about the use of Guide events is presented. Information on the different Display Ideas and Materials follows. The final sections present information on the Handouts and Activity Sheets that were used as part of both libraries' events and displays.

The Guide's Library Events

The Guide provided libraries with a full description of how to plan for and implement two events. Eleven sites hosted one or both of these events as part of their *Einstein's Big Idea* offerings. Nine sites hosted a *Trivia Night at the Science Kaffeehaus* event, and seven hosted an *$E=mc^2$ Scavenger Hunt.*

Sites that implemented these programs provided positive feedback about their experience hosting these events. Many reported that these events served audiences of multiple ages, which was considered a plus. Responses included:

> *I enjoyed the Trivia Night more – it pulled in people who might not otherwise attend a library program.*

Model sites' scavenger hunt and trivia night events brought new audiences to the library and created opportunities for multi-generational learning among patrons.

They were both great. We used the Scavenger Hunt as a library research and science fact learning contest. The Trivia Night brought out a cross-section of the community of all ages.

The Science Scavenger Hunt promoted active learning in teams. It was great to see teams of parents and kids focusing on research and working together all over the library.

Trivia Night at the Science Kaffeehaus was loads of fun! The kids loved the coffee, cappuccino drinks, and the biscotti that we served. Having the trivia competition with teams was probably their favorite part.

Eight model sites did not use either event option presented in the Guide. These sites indicated that they *already had plenty of age appropriate activities planned* or that they did not have the resources to complete these events (e.g., staff, time, space).

Display Ideas

In the Display Ideas section, the Guide provided suggestions for how libraries could help patrons explore different themes related to $E=mc^2$. This component was divided into ideas for children and those for young adults and adults.

The Guide's Display Ideas were used by 17 of the 19 model library sites, with most using between two and four Ideas as part of their Einstein's Big Idea events.

The Final Report Survey asked each model site to select, from a list of the five Display Ideas included in the Guide, those that they used as part of their *Einstein's Big Idea* programming. Most sites (n=17) used the Display Ideas. Of those, most used between two and four Ideas, and one site used all five. Two sites used only one Idea.

As seen in Table 3, *Get to Know $E=mc^2$* and *Who was Einstein?* were used most, followed by *Who are scientists? People like you!* and *Explore Energy*. *Tap into Your Inner Einstein* stands out as the least used Idea.

Table 3
Number of Model Library Sites That Used Display Ideas, by Intended Audience

		# model sites
For Children	Who are scientists? People like you!	10
	Explore Energy	9
For Young Adults and Adults	Get to Know $E=mc^2$	15
	Who was Einstein?	14
	Tap into Your Inner Einstein	2

N=19

In an open-ended question, model sites were asked to describe the Display Idea they liked best/least. With the exception of *Tap into Your Inner Einstein*, each of the Display Ideas was selected as "best" by at least one site. Three model sites provided uniformly positive feedback and stated that they could not pick a "best" Display Idea.

Get to Know E=mc² and *Who Was Einstein?* were the Display Ideas selected most often as favorites (n=4 each); recall that these were also the Ideas used by the largest number of model library sites.

In a follow-up question, model sites were asked to explain why they chose a certain Display Ideas as "best."

- Sites that chose *Get to Know E=mc²* said they selected it because it *explained the equation in a simple to understand way*.
- Those that chose *Who Are Scientists? People Like You!* and those who chose *Who is Einstein?* indicated that these Ideas *showed that scientists are people just like any of us*.
- The remaining responses did not vary based on the Display Idea picked, with some picking Ideas because they *proved to be the most popular* and others choosing Ideas that could be used to highlight their library's collection.

Neither of the two sites that did not use the Display Ideas explained why when asked. Instead, one site said that they *created a book display that used a cross-section of books from their children, young adult, and adult collections,* and the other stated that they *used Einstein's Big Idea as a general theme.*

Although the WGBH Final Survey asked model sites to comment on the Display Idea they liked best/least, none of the model sites provided information about their least favorites. Based on the fact that *Tap into Your Inner Einstein* was the Display Idea used the least and was not a favorite of any of the model sites, it might be considered the least favorite Idea. However, none of the model sites provided additional feedback about this Idea and why they did not use it.

Most sites used more than one of the Display Materials provided in the Guide, and all 19 sites used the Einstein's Big Idea poster.

Display Materials

In addition to the Display Ideas, the Guide provided several different ready-to-use materials. These included a poster to use as part of a display, three smaller display sheets, Web site markers, and a template for creating stickers and/or magnets.

All model library sites used at least one of these Display Materials. Most model sites (n=10) used four of the eight Display Materials Items provided in the Guide. One site used two Items, two used three Items, and two sites each used five, six, and seven Items. As shown in Table 4:

- All model library sites used the display poster from the Guide.
- Most used all three display sheets.
- Approximately one-fifth used one of the two Web site markers.
- Approximately one-fifth of the sites used either the magnet or the sticker template.

Table 4
Number of Model Library Sites that Used Each Display Materials Item

	# model sites
Einstein's Big Idea Poster	19
What does it mean? (display sheet)	16
One powerful equation (display sheet)	16
What has it done for you lately? (display sheet)	16
Who put the E into $E=mc^2$? (Web site marker)	7
Mass of 100 pennies (Web site marker)	4
$E=mc^2$ stickers	4
$E=mc^2$ magnets	2

N=19

As with the Display Ideas, model library sites were asked to report on the Display Materials Item they liked best/least. The poster was selected as the overwhelming favorite, with 11 sites choosing this Item. Each of the display sheets was also selected as a favorite by at least one site. Neither of the Web site markers was selected.

When given the opportunity to describe the poster, model sites commented:

> *The Einstein's Big Idea poster was used as a focal point for a few of our displays and was really an eye-catcher. It was very professionally done and looked good from a distance also.*

> *The Einstein's Big Idea poster was very nice because it was large, attractive, and educational – highlighting Einstein, but acknowledging the contributions of other scientists.*

> *The EBI poster was our favorite for its outstanding design and we used it in several displays.*

The sticker/magnet template received mixed feedback, with two sites choosing it as their favorite Item and three choosing it as their least favorite. The template was not used by many sites, and the challenges presented by those who named this Item as least favorite may explain why. They noted:

> *The magnets and stickers were too problemat*[ic] *for our printers (getting the right paper, getting everything to line up exactly right, making sure the ink wouldn't just rub off right away, cost compared to paper handouts of bibliographies, bookmarks, etc.)*

> *I did not use the magnet/sticker template because it was unattractive and not appealing to the children I surveyed.*

There weren't enough stickers or magnets to try to use them very effectively.

Reproducible Handouts

The Guide also included three reproducible Handouts for libraries to use as part of their displays and/or events. Seventeen of the 19 sites used the Handouts. Nine sites used all three Handouts, and the remaining eight used either one or two. Table 5 shows the number of sites that used each. Of the 17 sites that used a Handout:

- Similar numbers of sites used *E=mc² Explained* and *Who was Einstein?*
- Fewer sites, but still a majority, used *Some Outstanding Women of Nuclear Physics*

17 of the 19 model sites used at least one of the Reproducible Handouts from the Guide. Each of the three Handouts was selected as a favorite by a small number of model sites.

Table 5
Number of Model Sites that Used Each Reproducible Handout

	# model sites
E=mc² Explained	16
Who was Einstein?	15
Some Outstanding Women of Nuclear Physics	10

N=19

Sites that used multiple Handouts (n=15) were asked to describe the one they liked best/least. Thirteen sites responded to this question with a relevant response.[4] Each of the three handouts was selected as "best" by a small number of sites. Five sites choose *Who was Einstein?* as "best," and two sites each chose the other Handouts. Two additional sites indicated that the different Handouts they used were "*equally good*."

Model sites that picked *Who was Einstein?* as their favorite indicated that it was easy to understand and could be used with multiple audiences. Feedback about this Handout is best summarized by the following comment: "*Who Was Einstein? was written* [such] *that I was able to use it for programs with both my school age and teens."*

Both sites that chose *E=mc² Explained* as the best Handout felt that it did a good job of unpacking the equation. For example, one said, "*I really liked E=mc² Explained. That sheet explained to me in simple terms what the equation means*."

The two sites that picked *Some Outstanding Women of Nuclear Physics* as "best" selected it for different reasons. The first believed that it was *a useful handout because it presented a topic that receives little attention*. The second said, "*I personally liked the Outstanding Women one best because science isn't one of my strong points*."

[4] The two remaining sites provided a description of how they used the Handouts but did not provide any feedback on which Handout was "best."

Both sites that elected not to use the Handouts indicated that they were not a good fit for their program. One reported that their site was "*more focused on having patrons come in for the in-library events"* and the other site "*chose to use other hand-outs that related to* [their] *programs*."

Reproducible Activity Sheets

Three reproducible Activity Sheets were included in the Guide. These resources were designed for child or young adult audiences and consisted of games and puzzles that reinforced the content of *Einstein's Big Idea*.

Magnet Maze was considered the best of the three Activity Sheets provided in the Guide because it appealed to a wide range of youth audiences..

Compared to the other resources in the Guide, the Activity Sheets were used by a smaller number of model sites (n=12). Of the sites that used Activity Sheets, most (n=7) used two of the three Activities. One site used one Activity and four sites used all three. As seen in Table 6, each of the 12 sites used *Magnet Maze* and 11 used the *E=mc² Puzzle*. Far fewer libraries used *Putting the Pieces Together*.

Table 6
Number of Model Sites that Used Each Reproducible Activity Sheet

	# model sites
Magnet Maze	12
E=mc² Puzzle	11
Putting the Pieces Together	4

N=19

Libraries that used an Activity Sheet were asked to describe the Activity that worked best. Several sites provided a description of Activity implementation in response to this question rather than responding with the Activity that worked best. Of those that did answer the question, all chose *Magnet Maze*. Sites believed this Activity was the best because it appealed to multiple age groups and was fun. Representative quotes include:

> *"Easy for people of all ages to try."*
>
> *"…this was probably the most popular program for children. Most children are simply fascinated with magnets and they had so much fun."*
>
> *"The Magnet Maze worked best for us because it appealed to the broadest range of kids. Pre-readers could enjoy it, but it was interesting to older children as well."*

These sites were also asked if they had any problems with any of the Activities from the Guide. The majority of sites responded *no*. One site suggested modifying the *Magnet Maze* to make it larger. None of the model sites provided feedback in response to this question that would explain why *Putting the Pieces Together* was used less often than the other two Activities.

Five of the seven model sites that did not use the Activity Sheets explained their decision.

- Three sites preferred to use their own resources to create programming.
- Two sites chose to modify the Scavenger Hunt and Trivia events presented in the Guide to use with younger audiences, rather than using the Activity Sheets.

Model Library Sites' Feedback about the Guide and Project

Most and Least Useful Guide Resources

Each model site was asked, in an open-ended question, to identify the Guide resource that was most useful to them. Eighteen model sites responded to this question.

In general, model sites did not identify the specific resources that were most helpful. The poster (n=4), Trivia Night Event (n=3), and list of Web sites (n=3) were the resources mentioned most often. The Magnet Maze, Puzzle, and bibliography were mentioned by two sites each. Other sites gave more general responses such as the display materials, handouts, or activities.

Model sites believed that the number of activities included in the Guide was just right and compared it favorably to other educational resources.

Twelve model sites responded when asked to list the least useful resource in the Guide. Of those, half named either the magnet/sticker template or Web markers, indicating that they were difficult to use or that they were not of interest to library patrons. One site commented, "*My only complaint is the blue color used throughout the guide and on the resources that we were meant to copy. It was not pleasing or effective.*"

Feedback on the Number of Activities Included in the Guide

The Final Report Survey asked whether the Guide offered too many/not enough activities. Seventeen sites responded to this question. Most (n=10) reported that the number of activities included in the Guide was just right.

Seven sites indicated that they would have liked more activities included in the Guide. Two of these expressed a general interest in having more activities, with comments such as *the more the better*. Others requested additional activities for specific audiences, including four sites who wanted additional activities for young children and one who requested more activities for teen audiences.

Comparing the Guide to Other Educational Resources

Each model library site was asked to compare the *Einstein's Big Idea* Guide to other educational resources they have used. Eleven sites responded to this question, with almost all reporting that the Guide was comparable to (n=5) or better than (n=5) other resources they have used. The final site provided overall

positive feedback about the Guide but reported that it did not have as many activities for younger children as others they have used.

Model sites reported the following:

> *The guide is thorough and well designed, with attractive reproducibles and many useful ideas. It compares well with other resources I have used.*

Einstein's Big Idea allowed libraries to strengthen and initiate science programming.

> *The guide was nicely organized and provided a wealth of information. It was very professionally packaged and of sturdy paper stock. I found it comparable to other guides I have used, though unique in that it covered programs for all ages in one guide.*

> *It was very attractive and highly useful. I would compare it to other resources as being above average.*

> *The guide compares very favorable with other educational resources we have used. We appreciated the full-color, ready-to-use, content-rich materials.*

Benefits of Using the Guide

In their responses to the Final Report Survey, many libraries included statements reflecting ways in which their library had benefited from implementing *Einstein's Big Idea* programs. Four benefits, in particular, stood out across the comments made: bringing in new audiences, creating interest among a wide age range of patrons, adding science programming to their offerings, and building partnerships. Sample statements related to each area are presented in Table 7.

Table 7
Benefits of Being an *Einstein's Big Idea* Model Library Site

Bringing in new audiences	*I think our variety of events brought in people who don't usually come to the library.* *Einstein's Big Idea gave us an opportunity to show the "fun" side of the library.* *Many non library goers were attracted by the unusual events and discovered the joy of the library and its treasures.* *The attention we have received from this program and the whole series is leading to other community contacts, grant opportunities, and increased interest in our science programming.*
Interest to wide range of ages	*I liked the program because it was for kids and adults.* *The Einstein programs…allowed* [our library] *a chance to showcase local teachers with what they do best – teach science in a fun and engaging format to make it accessible for all ages.* *For our adult patrons, they were introduced to concepts that they may have briefly encountered in their daily lives or perhaps had not encountered since their last science class in high school or college.…Our children were introduced to science in a way that is fun and exciting with music included. It was definitely not the same "boring stuff" of the classroom variety.* *The program was very successful and a wonderful evening of intergenerational cooperation as teams tried to beat each other out for prizes.*
Adding science to more traditional library programming	*It helped us realize that we have a strong audience for science programming and information. We are highly skewed in the direction of arts and humanities and would have been skeptical of interest had we not participat*[ed] *as an outreach site.* *Our books on science are now being borrowed more than ever.* *We had several great discussions about Einstein theories and I believe everyone came away feeling more inspired and knowledgeable about Einstein and his theories.* *I had never done any science programming before (other than book discussions of a specific nature). And Einstein being so pervasive in so many areas was a perfect excuse for introducing such programming.*
Building Partnerships	*This project also helped us address several more specific goals, including working in closer collaboration with the local schools (through the in-class visits of scientists and high school students and participation by school officials in our planning process).* *Science and technology is being emphasized in our schools and our libraries want to provide materials and activities to support the learning process for our students. These types of materials, programs, and partnerships tend to be expensive and we could not have afforded them on our own.* *This program helped to us to reach out to all ages and especially teens. It also helped to strengthen our connection to Brunswick High School and Bowdoin College.* *The most successful event was our playing with light and color event through the Children's Museum.*

Suggestions for Future Library Outreach Programs

The Final Report Survey provided two opportunities for model library sites to provide comments about the Guide and/or suggestions for how to improve Guides developed for future projects.

Four sites stressed the general importance of distributing the Guide several months before programs are expected to be scheduled. In reference to *Einstein's Big Idea,* five of the respondents mentioned that it would be important to have more lead time between awarding the grant and the implementation deadline, in order to allow more time to plan events and create publicity pieces. Three felt it would have been beneficial to receive the *Einstein's Big Idea* materials together as a complete package with a bit more lead time. Representative comments included:

> *"The earlier this is received the better!"*
>
> *"I wish I could have received the guide much earlier. Due to my calendar/program date, I'm forced to have all my program and activity planning done months in advance."*

When the sites were asked to make recommendations for future library outreach projects, they applauded the opportunity afforded to model sites through the *Einstein's Big Idea* program, both in terms of programming and professional development for librarians. For example, model sites commented:

> *"I liked meeting the other project coordinators at the workshop…It gives libraries the motivation to make connections in the community."*
>
> *"The guide was a great help for non-scientist librarian program planners on our staff."*
>
> *"Since several staff members in our Children's, Adult, and Patent/Trademark divisions worked on planning different events…there was also much cooperative planning that went on within the library."*

The value of working with materials that are multidisciplinary in nature and that include multiple age groups was also noted. Five sites noted these characteristics in the *Einstein's Big Idea* Guide and requested that similar materials be created for future programs. For example, one site commented:

> *"I found it interesting to have the opportunity to keep a theme for a season for all our science programs—all ages learning the same thing and having the opportunity to discuss the topics across generations. It also provided for selective depth of learning. Patrons could choose how immersed they wanted to be in the topic and had more than one chance to become involved."*

Finally, model sites also recommended additional materials that could be added to future Guides and topics that they would like to see covered in future programming efforts. Examples of these comments are provided in Table 8.

Table 8
Sample Recommendations Made by Model Library Sites

Materials to Include in Future Guides	▪ *The listserv that you set up was very useful for finding sources for purchasing Einstein-related items and for sharing ideas and experiences with our fellow Einstein's Big Idea libraries.* ▪ *In addition to the printed resource guide, it would be terrific if there were a box of three-dimensional goodies for display or hands-on use.* ▪ *Provide catchy display materials. (The lifesize Einstein cutout figure and color Einstein Stamp display drew a lot of attention.)* ▪ *Provide media kits to help generate local PR.*
Ideas for Future Programming	▪ *Another topic that draws on many different spheres the way Einstein's Big Idea* [provided the] *scope for exploring science, biography, the role of women in intellectual discovery, the ethical and moral implications of science and technology, and so many other areas.* ▪ *History programs such as Biographies, Ben Franklin, renaissance man; History of Fairy Tales ("Who really was Mother Goose" or "The Real Brothers Grimm"); Areas where there is an anniversary (Check Chase's Annual Events for a list of them)* ▪ *Earthquakes, hurricanes and other earth-changing and weather related topics* ▪ *A history of medicine and diseases* ▪ *2006—year of genetics* ▪ *Science fiction to science fact—how the stories of today become the reality of tomorrow*

FEEDBACK ABOUT AND PERCEIVED INFLUENCE OF *EINSTEIN'S BIG IDEA* LIBRARY EVENTS ON PATRONS

Using surveys developed by GRG, model library sites collected data from adult, young adult, and child patrons who attended their *Einstein's Big Idea* events. Results are presented below to describe feedback from each group of patrons, as well as the extent to which patrons believed the programs promoted *Einstein's Big Idea* learning goals and continued engagement with related topics.

Adult Patrons

A total of 743 adult patrons completed the Adult Patron Survey. As seen in Table 9, an equal number of men and women participated in *Einstein's Big Idea* library events. Participants were of all ages; the youngest participant was 18 years of age and the oldest was 88. The vast majority of participants were White.

Table 9
A Description of Adult Patrons Who Attended *Einstein's Big Idea* Library Events

		% Respondents
Gender	Female	50%
	Male	50%
Age	18-30 years old	9%
	31-45 years old	24%
	46-60 years old	36%
	61-75 years old	24%
	76 and older	7%
Race/Ethnicity	African American	2%
	American Indian	2%
	Asian/Pacific Islander	7%
	Hispanic	2%
	Native Hawaiian/Pacific Islander	1%
	White	89%

Number of respondent ranged from 624-645 across questions.

Adult patrons who attended Einstein's Big Idea library events included both those who watch science programs occasionally and those who watch on a regular basis.

Adult patrons included both those who watch science programs occasionally and those who watch science programs on a regular basis. Over half (61%) of adult patrons reported watching science programs once a month or more.

- 25% reported watching science programs on television *once a week or more*,
- 21% reported watching *a few times a month*,
- 15% reported watching *once a month*,
- 32% watch science programs *a few times a year*,
- 4% reported watching *once a year*, and
- 3% reported that they *never* watch science programs on television.

Adult patrons attended *Einstein's Big Idea* library events for a variety of reasons. When presented with a list of six reasons for attending their library's event, adult patrons selected between one and two reasons on average. The top two reasons selected were a general interest in science and, more specifically, an interest in Einstein (see Table 10).

Table 10
Reasons Adults Attended Library Events

	% respondents
Because I like science	56%
I'm interested in Einstein	54%
I come to events at the library often	26%
Came with friends who invited me	14%
I came with a club or group	9%
Just happened to be at the library	2%

N=680

Most adult patrons attended a library event because they like science or have an interest in Einstein. Only one quarter of adult patrons reported that they regularly attend events at their library.

Adult patrons were also given the option to explain other reasons that they attended the event. A total of 139 (20%) provided an "other" reason for attending. GRG coded these responses based on theme. As seen in Table 11, the most commonly cited reasons included patrons' interest in bringing their children to the event and patrons' own interest in particular speakers involved in the event. A notable percentage also attended in order to learn more about a specific scientific concept.

Table 11
Top "Other" Reasons Adult Patrons Attended Events

Wanted to experience science with the family (22%)	▪ To expose my young girls to science. ▪ Grandchildren visiting. ▪ My son wanted to come. ▪ For my small children.
Wanted to hear this particular speaker (16%)	▪ We wanted to hear Dr. Franknoi. ▪ Chet Raymo makes a subject come alive and is a great speaker. ▪ Panel of speakers.
Learn more about a specific concept (12%)	▪ Thesis of science versus creative mythology. ▪ Fascinated by the theory of relativity. ▪ I need to know more about physical science.

N=139

Adult patrons believed that their Einstein's Big Idea event focused on each of the program's learning goals.

Descriptions of Their Einstein's Big Idea Library Events

Adult patrons were asked to indicate whether their library's event focused on each of the *Einstein's Big Idea* learning goals. The majority of adults indicated that their library program included content related to each area (see Table 12).

- Almost all programs were believed to have focused on science as a creative process, the impact science has on our lives, and science as a process of human discovery.
- Fewer patrons (although still the majority of the sample) reported that their program focused on the different backgrounds of those who have contributed to science and the ethical dilemmas associated with science.

Table 12
Percentage of Adult Patrons Who Indicated Specific *Einstein's Big Idea* Learning Goals Were Included in Their Event

	% respondents
Science is a creative process	93%
Science is a process of human discovery	90%
People of many different backgrounds have contributed to science	81%
Science impacts almost every aspect of our lives	90%
Scientific advances often bring about ethical dilemmas	78%

Number of respondents ranged from 679-694 across questions.

Nearly two-thirds of the adult patrons surveyed (63%) also indicated that their library displayed *Einstein's Big Idea* materials to promote the show and its air date.

Adult patrons enjoyed their library event, and over three-quarters reported that it was very or extremely informative.

Feedback About Einstein's Big Idea Library Events

Adult patrons were given the opportunity to rate their library event on four characteristics using a five-point scale of 1 (*Not at All*) to 5 (*Extremely*). Respondents provided positive feedback about each of the four characteristics (see Table 13).

- Adult patrons rated their *Einstein's Big Idea* library event as *very* to *extremely* enjoyable, on average.
- Library events were rated as *very* informative and easy to understand.
- Adult patrons felt that, on average, library events were *somewhat* to *very* interactive.

Table 13
Adult Patrons' Ratings of *Einstein's Big Idea* Library Events

		Not at all 1	A little 2	Somewhat 3	Very 4	Extremely 5
Enjoyable	mean=4.37	0%	1%	10%	38%	51%
Informative	mean=4.12	0%	6%	12%	45%	37%
Easy to Understand	mean=4.10	0%	4%	18%	41%	37%
Interactive	mean=3.84	4%	9%	22%	28%	37%

Number of respondents ranged from 634 to 651 across questions.

Most adult patrons reported that they were very or extremely interested in attending similar events at their library in the future.

Positive feedback was also provided when adult patrons were asked if they would attend other science-related events at the library. Using a five-point scale from 1 (*Not at All*) to 5 (*Extremely*), 79% of adult patrons reported that they were either *very* or *extremely* interested in attending future events.

- 34% reported that they were *extremely interested* in attending another science-related event at their library,
- 45% were *very interested*,
- 17% were *somewhat interested*,
- 4% were *a little interested*, and

- Fewer that one percent of adult patrons reported that they were *not at all interested* in attending future science-related events.

Perceived Learning from Einstein's Big Idea Library Events

To provide information on the extent to which *Einstein's Big Idea* events exposed them to new information and helped them learn more about WGBH's learning goals, adult patrons reported on both the overall amount of new information they received at their event and the extent to which they learned about specific topics of interest.

Einstein's Big Idea library programs were effective at both providing adult patrons with new information and encouraging them to think more about the program's learning goals.

The amount of new information included in *Einstein's Big Idea* events was rated on a scale of 1 (*None*) to 5 (*A lot*). Almost all adult patrons reported that their event included information that was new to them; events were rated as including *some* to *quite a bit* of new information on average (mean rating = 3.64).

- 21% reported *a lot* of new information was presented at their library event,
- 38% reported that *quite a bit* of new information was presented,
- 27% were provided with *some* new information,
- 12% received *a little* new information, and
- 2% reported that their library event did not include any information that was new to them.

Adult patrons also reported the extent to which their library's event made them think more about *Einstein's Big Idea's* learning goals on a scale of 1 (*None*) to 4 (*A Great Deal*). Participants reported that their library's event made them think between *some* or *a great deal* more about each of *Einstein's Big Idea's* learning goals, on average (see Table 14).

Table 14
The Extent to Which Adult Patrons Thought More about *Einstein's Big Idea*'s Learning Goals as a Result of Attending a Library Event

	None 1	A little 2	Some 3	A Great Deal 4
Science is a creative process mean=3.29	2%	17%	31%	50%
Science is a process of human discovery mean=3.23	2%	18%	36%	44%
People of many different backgrounds have contributed to science mean=3.03	5%	24%	35%	36%
Science impacts almost every aspect of our lives mean=3.21	3%	19%	31%	47%
Scientific advances often bring about ethical dilemmas mean=2.96	10%	20%	35%	35%

Note that only the adult patrons who indicated the topic was covered at their event were asked to provide ratings; the number of respondents ranged from 527 to 643 across questions.

In addition to reporting on *Einstein's Big Idea's* learning goals, adult patrons used a similar four-point scale to rate how much they learned about seven key concepts. As seen in Table 15, adult patrons reported learning between *a little* and *some* about each key topic as a result of their library's event. Adult patrons reported learning the most about who Albert Einstein was and why he is famous.

Table 15
Adult Patrons' Perceived Learning from *Einstein's Big Idea* Library Events

	None	A Little	Some	A Great Deal
The lives of scientists across history mean=2.68	15%	26%	36%	23%
Who Albert Einstein was and what he was most famous for mean=3.14	7%	16%	34%	43%
The different pieces that make up the $E=mc^2$ formula mean=2.68	24%	18%	25%	33%
The role of women and people from diverse cultures in science experimentation and discovery mean=2.25	37%	23%	19%	21%
The relevance of $E=mc^2$ to life today mean=2.76	18%	23%	33%	26%
The history of how Einstein came up with $E=mc^2$ mean=2.39	23%	23%	26%	28%
The scientific process mean=2.76	13%	23%	40%	24%

N=689-708

Adults' Ability to Identify Components of $E=mc^2$ After Attending a Library Event

The Adult Patron Survey asked respondents to identify three components of the $E=mc^2$ equation (E, m, and c) after attending their library's event. Almost half (47%) of adult patrons correctly identified all three components, with an additional 41% correctly identifying two of the three.

- 87% of adult patrons correctly stated that E stands for energy after attending their library's event,
- 81% correctly stated that m stand for mass, and
- 66% correctly stated that c stands for the speed of light.

Library events were effective at creating interest among adult patrons in the NOVA broadcast.

Longer-Term Influences of Einstein's Big Idea Library Events on Adult Patrons

The longer-term influence of the library events was measured by asking adult patrons whether they would continue to engage with *Einstein's Big Idea* content after leaving the event. Respondents rated whether they planned to complete four specific activities.

As seen in Table 16, approximately two-thirds of adult patrons planned to complete three of the four activities listed on the survey, including watching the NOVA program, learning more about Einstein, and seeking out other science events. Approximately one-third of adult participants also indicated that they would read David Bodanis's book.

Table 16
Adult Patrons' Plans to Continue Engaging with *Einstein's Big Idea* Content

	Yes	No	Not Sure
Watching *Einstein's Big Idea*	72%	11%	17%
Learning more about Einstein and related issues	64%	11%	25%
Seeking out other science events	62%	10%	28%
Reading the David Bodanis book	34%	27%	39%

Number of respondents ranged from 599 to 628 across questions.

Einstein's Big Idea events encouraged adult patrons to participate in science-related activities that they would not have done otherwise.

Adult patrons who indicated that they planned to complete one of these activities were then asked to indicate the extent to which their library's event had influenced their plans.

- 51% of those who planned to watch *Einstein's Big Idea*, as well as those who planned to take steps to learn more about Einstein, indicated that their library event had influenced their interest *a great deal*, meaning that they *would not have done it otherwise*.
- 44% of those who planned to seek out additional science events believed that these plans were influenced *a great deal* by attending their library's event.
- 65% of those who planned to read David Bodanis's book indicated that they would not have planned to read the book had they not attended their library's event.

Young Adult Patrons

Young Adult Patron Surveys were completed by a total of 385 respondents between the ages of eight and 17 (see Table 17). Most young adult patrons were 11 or 12 years of age, and slightly more males than females completed the survey. The racial/ethnic distribution for the young adult patrons was almost identical to that of the adult patrons presented in the previous section.

Table 17
A Description of Young Adult Patrons Who Attended *Einstein's Big Idea* Library Events

		% Respondents
Gender	Female	42%
	Male	58%
Age	8-10 years old	4%
	11-12 year old	66%
	13-14 years old	12%
	15-16 years old	10%
	17 years old	8%
Race/Ethnicity	African American	2%
	American Indian	2%
	Asian/Pacific Islander	6%
	Hispanic	4%
	Native Hawaiian/Pacific Islander	3%
	White	87%

Number of respondent ranged from 341-353 across questions.

Some young adult patrons reported watching science programs on television on a regular basis, while other reported never watching science programs. When provided with a list of options:

- 10% of young adult patrons indicated that they watch science programs on television *once a week*,
- 19% reported watching these programs *a few times a month*,
- 9% watch science programs *once a month*,
- 27% watch science programs on television *a few times a year*,
- 10% watch these programs about *once a year*, and
- 25% reported that they *never* watch science programs on television.

As with the Adult Patron Survey, young adults were provided with a list of options and asked to select the reasons they attended their library's event (see Table 18). On average, young adults selected between one and two reasons for attending, with the largest number indicating they attended their *Einstein's Big Idea* event as part of a school group or project. Approximately one-quarter of young adults attended the event because they like science, and just under one-fifth attended because they are interested in Einstein.

Table 18
Reasons Young Adult Patrons Attended Events

	% respondents
I came as part of a school group/project	41%
Because I like science	26%
I'm interested in Einstein	19%
My parents brought me	13%
I come to events at the library often	11%
I came with friends who invited me	6%
I came with my after-school group/club	1%

N=355

Most young adult patrons attended their Einstein's Big Idea event as part of a school-based program.

When asked to provide other reasons that they attended the *Einstein's Big Idea* event, young adult patrons (N=115) took the opportunity to elaborate on the fact that they participated in the program as part of a school- or grade-wide activity (35%) or commented that their participation was mandatory (42%). Comments included:

Were brought down with whole 6th grade.

It was a school event.

Our school made us – no option.

I was forced to.

Report of the Topics Included in Einstein's Big Idea Library Events

Young adult patrons were asked to indicate which of the *Einstein's Big Idea* learning goals were covered in their library's event. As seen in Table 19, the majority of young adults believed that most of the learning goals were covered in their event. Even though some young adult programs differed from those offered to adults, the overall pattern of the adult and young adult data is quite similar.

Young adult patrons reported that each of the program's learning goals was covered in their event.

Table 19
Percentage of Young Adult Patrons who indicated Specific *Einstein's Big Idea* Learning Goals Were Included in Their Event

	% respondents
Science is a creative process	96%
Science is a process of human discovery	90%
People of many different backgrounds have contributed to science	82%
Science impacts almost every aspect of our lives	92%
Scientific advances often bring about ethical dilemmas	80%

Number of respondents ranged from 288-350 across questions.

Approximately one-third (31%) of young adult patrons also indicated that their event included an *Einstein's Big Idea* display that promoted the show and its air date.

On average, young adult patrons rated their library event as somewhat to very enjoyable and informative.

Feedback about Einstein's Big Idea Library Events

Young adult patrons were asked to describe four characteristics of their event, using a scale of 1 (*Not at All*) to 5 (*Extremely*). As seen in Table 20:

- Over half of the young adult patrons rated their *Einstein's Big Idea* event as *very* to *extremely* informative and enjoyable.
- Young adults provided similar rating when asked to rate the extent to which their library event was interactive and easy to understand; the rating for both characteristics was between *somewhat* and *very*.

Table 20
Young Adult Patrons' Perceptions of Specific Qualitative Event Characteristics

		Not at all 1	A little 2	Somewhat 3	Very 4	Extremely 5
Enjoyable	mean=3.35	13%	17%	19%	24%	27%
Informative	mean=3.54	5%	12%	27%	36%	20%
Easy to understand	mean=3.24	10%	17%	28%	28%	17%
Interactive	mean=3.27	11%	18%	27%	21%	23%

Number of participants ranged from 351 to 357 across questions.

Young adult patrons were asked to report how interested they would be in attending future science-related events at their library using a scale of 1 (*Not at All*) to 5 (*Extremely*). Over one-third (39%) indicated that they were either *very* or *extremely interested* in attending similar events in the future.

- 19% reported that they were *extremely interested* in attending another science-related event,
- 20% were *very interested*,
- 26% were *somewhat interested*,
- 19% were *a little interested*, and
- 16% reported that they were *not at all interested* in attending another science-related event at their library.

Library events were effective at providing new information to young adult audiences.

Perceived Learning from Einstein's Big Idea Library Events

Most young adult patrons indicated that their *Einstein's Big Idea* event presented information that was new to them. The amount of new information was rated on a scale of 1 (*None*) to 5 (*A Lot*).

- 15% of young adult patrons reported that *a lot* of the information presented at their library's event was new to them,
- 33% reported *quite a bit* of new information was presented,
- 33% received *some* new information,
- 15% were presented with *a little* new information, and
- 4% reported that *none* of the information presented at their library's event was new to them.

Young adult patrons reported the extent to which their library's event made them think more about each of *Einstein's Big Idea's* learning goals, on a scale of 1 (*Not at All*) to 5 (*Very Much*). As seen in Table 21:

- Young adult patrons thought *somewhat* to *quite a bit* more on average about science in our everyday lives and science as a creative process as a result of attending their library's event.
- The extent to which they thought more about science as a process of human discovery and the different kinds of people who have contributed to science increased *somewhat* on average.
- Young Adults thought *a little* to *somewhat* more about the ethical dilemmas involved in science as a result of attending their library's *Einstein's Big Idea* event.

Table 21
The Extent to Which Young Adult Patrons Thought More about *Einstein's Big Idea's* Learning Goals as a Result of Attending a Library Event

	Not at all 1	A little 2	Somewhat 3	Quite a Bit 4	Very Much 5
Science is a creative process mean=3.34	8%	19%	27%	23%	23%
Science is a process of human discovery mean=3.01	10%	27%	31%	16%	16%
People of many different backgrounds have contributed to science mean=3.01	16%	22%	26%	20%	16%
Science impacts almost every aspect of our lives mean=3.38	11%	19%	19%	23%	28%
Scientific advances often bring about ethical dilemmas mean=2.77	19%	25%	30%	12%	14%

Note that only the young adult patrons who indicated the topic was covered at their event were asked to provide ratings; number of participants ranged from 288 to 350 across questions.

Of the key topics rated, young adults reported learning the most about who Einstein was and why he was famous.

In addition to reporting on the learning goals above, young adult patrons reported how much they learned about seven key topics, using a scale of 1 (*None*) to 5 (*A Lot*). See Table 22.

- Young adults reported that, as a result of attending their library's event, they learned the most about who Albert Einstein was and why he was famous.
- They reported learning *some* about $E=mc^2$, the scientific process, Einstein's creation of $E=mc^2$, and the relevance of the formula to life today.
- On average, young adults indicated that they learned between *a little* and *some* about scientists across history and the role of women and other minorities in science.

Table 22
Young Adult Patrons' Perceived Learning from *Einstein's Big Idea* Library Events

	None 1	A Little 2	Some 3	Quite a Bit 4	A Lot 5
The lives of scientists across history mean=2.55	19%	35%	26%	13%	7%
Who Albert Einstein was and what he was most famous for mean=3.34	12%	18%	18%	29%	23%
The different pieces that make up the $E=mc^2$ formula mean=3.14	17%	18%	22%	19%	24%
The role of women and people from diverse cultures in science experimentation and discovery mean=2.21	42%	23%	17%	9%	9%
The relevance of $E=mc^2$ to life today mean=2.87	15%	30%	22%	20%	13%
The history of how Einstein came up with $E=mc^2$ mean=2.92	22%	20%	21%	20%	17%
The scientific process mean=3.13	14%	18%	27%	23%	18%

Number of participants ranged from 370 to 377 across questions.

Young Adults' Ability to Identify Components of $E=mc^2$ After Attending a Library Event

As with the Adult Patron Survey, young adult patrons were asked to identify E, M, and C after attending their library's event. Approximately one-tenth (14%) correctly identified all three components of the equation, and an additional 47% identified two of the three. As with the adult patrons, fewer young adults identified c compared to the other components of the equation.

- 73% of young adult patrons correctly stated that E stands for energy,
- 53% correctly stated that m stand for mass, and
- 43% correctly stated that c stands for the speed of light.

Longer-Term Influence of Einstein's Big Idea on Teen Patrons

As with the Adult Patron Survey, the Young Adult Patron Survey asked participants to report on the longer-term influence of library events, by asking whether they planned to complete four specific activities related to *Einstein's Big Idea* content. Compared to the adult patrons, young adult patrons reported that they were less interested in engaging in these activities, but at least one quarter were interested in three of the four activities (see Table 23).

Table 23
Young Adult Patrons' Plans to Continue Engaging with *Einstein's Big Idea* Content

	Yes	No	Not Sure
Watching *Einstein's Big Idea*	25%	44%	31%
Learning more about Einstein and related issues	32%	37%	31%
Seeking out other science events	26%	43%	31%
Reading the David Bodanis book	9%	60%	31%

Number of respondents ranged from 336 to 340 across questions.

Approximately one-quarter of young adults reported they were interested in continuing to engage with content related to the program.

Young adult patrons who planned to complete one of the above activities were then asked to indicate the extent to which their library's event had influenced their plans. Overall, young adults reported being less influenced by their *Einstein's Big Idea* event than did adult patrons.

- 45% of young adult patrons believed that their plans to seek out additional science events were influenced *a great deal* by their *Einstein's Big Idea* library program, meaning that they *would not have done it otherwise*.
- 42% reported that their library's program influenced their plans to watch *Einstein's Big Idea a great deal*, and
- 38% felt that both their interest in reading David Bodanis's book and their interest in learning more about Einstein was influenced a great deal by their library's event.

Child Patrons

A total of 888 children completed the Child Patron Survey. Child patrons ranged in age from two to 12, with over half aged 10-11 years (see Table 24). Slightly more boys than girls participated in library events; the racial/ethnic distribution of child patrons mirrored that of the adult and teen patrons.

Table 24
A Description of Child Patrons Who Attended *Einstein's Big Idea* Events

		% Respondents
Gender	Female	46%
	Male	54%
Age	2-5 years old	5%
	6-7 year old	13%
	8-9 years old	20%
	10-11 years old	52%
	12 year olds	10%
Race/Ethnicity	African American	4%
	American Indian	4%
	Asian/Pacific Islander	8%
	Hispanic	6%
	Native Hawaiian/Pacific Islander	1%
	White	83%

Number of respondents ranged from 806 to 844 across questions.

Child patrons included those who watch science programs on television regularly, as well as those who do not. When asked to report how often they watch science programs:

- 17% of child patrons reported watching science programs *a few times a week*,
- 23% reported watching these programs *a few times a month*,
- 9% watch science programs *once a month*,
- 21% watch *a few times a year*,
- 7% watch a science program about *once a year*, and
- 23% reported that they *never* watch science programs on television.

Activities Included in Einstein's Big Idea Library Events

Child patrons selected from a list of six activities those that were included as part of their library's event; 90% indicated doing at least one activity listed as part of their library's event. On average, children reported completing between one and two activities on the list, with the most commonly completed activities related to science experiments and science demonstrations (see Table 25).

Table 25
Activities that Child Patrons Reported Doing as Part of Their *Einstein's Big Idea* Event

	% respondents
Try out science experiments	55%
Watch a science demonstration	39%
Watch a performance about Albert Einstein or other scientist	16%
Play a game	8%
Do a scavenger hunt	6%
Solve a puzzle	5%

N=868

Child patrons reported that they had a lot of fun at their library's event.

Feedback about Einstein's Big Idea Library Events

Child patrons provided overall feedback about their *Einstein's Big Idea* event on a three-point scale. Over two-thirds (70%) of child patrons indicated that they had *a lot* of fun at their library's event. An additional 26% reported that they had *a little bit of fun*, and only 4% reported that they *didn't have any fun* at their library's event.

In addition to providing a rating for their library's event overall, child patrons were asked to describe their favorite thing about the event. Most responses (79%) focused on a specific science-related activity that was completed as part of the library event. Responses included things like *playing with magnets*, *making a fossil*, *volcanoes*, and *balloon racing*. From these responses, it is clear that libraries supplemented the Guide with more general science activities that allowed them to use their *Einstein's Big Idea* events as a way to engage children in hands-on science activities.

85% of child patrons said they would like to attend another science event.

As a final piece of feedback, child patrons were asked to report whether they would like to attend other science events at the library or in their neighborhood; the majority of child patrons (85%) reported that they would.

Perceived Learning at Einstein's Big Idea Library Events

To provide information on the clarity with which content was presented to young patrons on the topics that were covered, child patrons reported how much of their event they understood overall, as well as whether they learned about specific topics.

The majority of child patrons reported that they understood what they heard and saw at their library's event. Using a four-point scale from 1(*Nothing*) to 4 (*All of It*),

- 44% of child patrons understood *all* of what they heard and saw at the event,
- 42% understood *most* of what they saw and heard,

- 12% understood *a little bit* of what was presented at their event, and
- 2% of child patrons understood *nothing* from their library's event.

Library events for child patrons were presented in an age-appropriate way, with children reporting that they understood most or all of the information presented to them.

Next, children selected, from a list of seven topics those that they learned about at their library's event. The vast majority of children (96%) reported learning about at least one topic on the list. Child patrons reported learning about one to two of the topics listed, on average. As seen in Table 26, most children reported learning about science, and approximately half reported learning about both Einstein and his famous equation.

Table 26
Child Patrons' Perceptions of Topics Learned at Their *Einstein's Big Idea* Library Event

	% respondents
Science	70%
Albert Einstein	48%
$E=mc^2$	43%
Energy	37%
Scientists	36%
Light	22%
Mass	22%

Number of respondents ranged from 868 to 883 across questions.

70% of child patrons reported learning about science as part of their library event.

IMPLEMENTATION OF *EINSTEIN'S BIG IDEA* EVENTS AT OTHER LIBRARIES AROUND THE COUNTRY

Of the 99 libraries that responded to GRG's survey, 58% had used the Guide.[5] Of those, most used the hard copy of the Guide or both the hard copy and online version.

- 48% of those who used the Guide used the hard copy, exclusively,
- 33% used both the hard copy and the online materials, and
- 19% used only the online version of the Guide materials.

Of the 99 national libraries who responded to GRG's survey, 58% implemented an Einstein's Big Idea event.

A Description of National Libraries' *Einstein's Big Idea* Events

Of the 57 libraries who reported they had used Guide materials, 51% reported that they had provided *Einstein's Big Idea* programs for child and young adult audiences. Slightly fewer (44%) reported hosting *Einstein's Big Idea* programs for adults.

Events included both scavenger hunts and trivia events similar to those suggested by the Guide; 19% implemented an *$E=mc^2$ Scavenger Hunt* and 7% used *Trivia*

[5] Note that the five ALA listserves used to distribute the survey reached a total of 8,600 registered users, but the lists have duplicates among them and include a small number of non-librarian educators. Given these circumstances, it is impossible to determine the total number of librarians who received the survey. Regardless, the 99 responses received are not enough to generalize these findings to the librarian population overall.

Night at the Science Kaffeehaus. These libraries also hosted events of their own design, many of which were similar to those developed by the model library sites. For example:

National libraries implemented similar events to those implemented by the model sites. These included the scavenger hunt and trivia night events from the Guide, as well as events of their own design.

- Several sites reported hosting hands-on science events and/or lectures. These included *Mad Science – a science experiment-based program for elementary ages*; *science fair workshops for families*; *physics talks*; *a guest lecture from a local philosopher on Einstein's life, work, and ideas*; and *science days at the library*.
- National libraries also screened *Einstein's Big Idea* as an event and some hosted screenings of related feature films such as *IQ* and *Young Einstein* or other science-related films such as NOVA's *Einstein Revealed*.
- Book discussions were hosted that featured the Bodanis book, as well as related texts such as *Einstein 1905*.
- One site reported hosting an event that featured a staged reading of the play, *The Einstein Project*.

Libraries' Use of the Guide

In addition to reporting the types of events they hosted, libraries were also asked to report the specific materials used from three sections of the Guide.

Display Materials

Libraries selected from a list of the Guide's Display Materials those that were used as part of their *Einstein's Big Idea* programming. Libraries' use of these resources was similar to that reported by the model library sites. As with the model sites,

Most national libraries used materials from each section of the Guide to create their Einstein's Big Idea events.

- The poster was the Display Material used most, with 86% of librarians using the poster.
- The display sheets were used by most libraries with 61% reporting that they used at least one of the three display sheets included in the Guide.
- The Web site markers were used by approximately one-third of libraries (32%).
- The $E=mc^2$ magnet or sticker template was the Display material used least often with 23% of libraries using this resource.

Reproducible Handouts

Libraries were asked to report whether they had used any of the three reproducible Handouts from the Guide. Of the libraries who implemented an *Einstein's Big Idea* event, 89% used at least one of the Handouts. Of those, just under half (45%) used all three Handouts, 33% used two of the three, and 22% used one. Table 27 shows the percentage of libraries that used each Handout.

Table 27
Percentage of Libraries that Used Each Reproducible Handout

	% libraries
E=mc² Explained	63%
Who was Einstein?	60%
Some Outstanding Women of Nuclear Physics	53%

N=57

Reproducible Activity Sheets

Libraries also reported on the use of the Activity Sheets. Approximately three-quarters (74%) of the libraries who implemented an event used at least one of the three Activity Sheets. Of those, 23% used all three Activity Sheets, 35% used two of the three, and 42% used one Activity Sheet. As seen in Table 28, similar number of libraries used each of the three Activity Sheets.

Table 28
Percentage of Libraries that Used Each Reproducible Activity Sheet

	% libraries
Magnet Maze	28%
E=mc² Puzzle	32%
Putting the Pieces Together	25%

N=57

Libraries' Feedback about the Guide

Most and Least Useful Guide Resources

National libraries considered the poster to be the most useful resource included in the Guide.

Each library was given the opportunity to describe the Guide resource that they found most and least useful. Thirty-six libraries provided a description of the resource they found most useful. Many libraries praised the poster in response to this question, with comments such as:

> *We used the display poster in our Einstein Book Display and I'm pleased to tell you that the books circulated very well.*
>
> *The posters helped us put up an attractive display.*
>
> *Poster, biggest splash of visibility.*

Others mentioned a combination of Display Materials providing comments such as *the poster, bookmarks, and Website markers were the most useful to me*. The Display Sheets, Display Ideas, and Handouts were also cited by at least one library as most useful. For example:

The info on other scientists and the display sheets for E=mc^2 and Einstein.

Display theme ideas. It gave a different perspective on how to promote the program.

Who [was] *Einstein? It was the best for the age range I had.*

The activity program guides – they were wonderful. I just had to follow the steps to put on a great program.

Most libraries did not list a resource that was least useful. Of the 13 responses received, four listed the magnet/sticker template as least useful because *it seemed like patrons did not take many of them* or because they *did not have the printers to accommodate* this idea. Two libraries cited the women of science Handout as least useful; one did not provide a reason for listing this resource but the other selected it *because* [s/he] *didn't have any resource books, movies, websites to back up the display*. One library listed the trivia night as least useful because it was *too long* and one said *the scavenger hunt – it seemed the children were not interested in the topic*.

The majority of national libraries reported that they will continue to use the Guide in the future.

Continued Use of the Guide

At the end of the survey, libraries were asked whether they will continue to use the Guide in the future. Importantly, 47 of the 57 libraries who used the Guide (82%) reported that they would continue to use it in the future. When asked why they would continue using it, many provided additional positive feedback about the Guide and/or mentioned being able to use the Guide as a reference or template for other programs. Libraries said:

Because it is full of good, useful ideas. Ideas and activities that we don't have to spend a lot of time customizing and can hit the ground running with.

Easy to understand and visually pleasing.

Interesting way to highlight collection.

It has some great activities that we could incorporate into a young adult program especially if we could coordinate with a curriculum unit at one of the schools.

We feel that it's important to continue doing science programming for children and the guide is a great template for how to do this.

This is [a] *topic that won't go 'out-of-fashion' and we can use some of the ideas for other related activities.*

CONCLUSIONS

Using model library sites is an effective way to ensure implementation of an outreach program.

The model library sites far exceeded the number of *Einstein's Big Idea* events they were required to hold and the number of people that they were expected to serve. Further, model sites provided positive feedback about the opportunity afforded to them through the *Einstein's Big Idea* program.

The *Einstein's Big Idea* Guide enabled model sites to serve a wide variety of library patrons, including new audiences.

Model library sites used the Guide activities and materials to serve child, young adult, and adult audiences, with most libraries hosting events for each of these different groups. Many also reported using the activities to create intergenerational learning experiences for patrons. Importantly, *Einstein's Big Idea* programming also permitted model sites to reach new audiences; only a small portion of patrons who attended *Einstein's Big Idea* events (26% of adults and 11% of young adults) reported that they regularly attend events at their library.

The *Einstein's Big Idea* Guide was considered of professional quality.

Model library sites reported that the Guide was comparable to or better than other resources they have used. Throughout the feedback provided, sites commented on the professional quality of the materials, with a particular focus on the poster.

The Guide provided model sites with the amount of information needed to implement activities but also allowed enough flexibility for libraries to modify programs to fit their needs.

The majority of model library sites felt that the amount of information included in the Guide was just right. Some sites used the activities as suggested, while other considered the Guide a template that they could build on to create programs of their own.

Model sites benefited from their participation in the project.

Model sites indicated that the *Einstein's Big Idea* project brought new audiences to their library, enabled them to serve audiences of multiple age groups, and gave them the opportunity to create new partnerships with local organizations. In addition, the project allowed libraries to add science-based programming to their more traditional offerings which showcased their science-based collections and led to an increased interest in these collections by patrons.

Library patrons enjoyed the *Einstein's Big Idea* library events.

Adults, young adults, and children who attended *Einstein's Big Idea* events provided positive feedback about their experiences. Over half of adult and young adult audiences reported that their event was *very* or *extremely enjoyable*. Similarly, most children reported that they had *a lot* of fun at their event. The majority of adults and children reported that they would be interested in attending similar events in the future.

Library patrons of all ages learned new information at their library event.

Adults, young adults, and children all reported learning from their *Einstein's Big Idea* event. Adult and young adult audiences reported learning information that was new to them at their event and that they learned content related to the program's key concepts; adults reported more learning than did young adults. Children reported that they understood most or all of the information presented to them at their events. Almost all children reported learning something at their event with most reporting that one thing they learned about was *science*.

Library events were successful at encouraging adults, and young adults to a lesser extent, to continue engaging with content.

Two-thirds of adults who attended library events reported that they would continue to engage with content related to their event by watching the NOVA program, continuing to learn about Einstein, or attending other science events. Young adult audiences were less affected by their events, with approximately one-quarter reporting an interest in participating in one or more of these activities.

Adult and child audiences were more receptive to library programs compared to young adult audiences.

Overall, adults and children were more positive about their library events and were more interested in attending similar events in the future. Compared to the adult audience surveyed, young adults reported learning less and were not as interested in continuing to engage with related content after leaving their event. It is unclear whether this is the result of the types of events that young adults attended (many reported that their attendance at events was required) or if young adults are simply a difficult audience to serve.

The model library sites' events seem representative of those carried out by other libraries across the country.

The national libraries that implemented *Einstein's Big Idea* events used the Guide materials in similar ways to those reported by the model library sites. Further, the events they designed on their own were also similar to those created by model sites. Although it is unclear how many national libraries used the

Guide, national and model sites seem to have implemented their programs similarly.

SUMMARY FINDINGS FROM *EINSTEIN'S BIG IDEA*

This section concludes this report by summarizing findings from across the three evaluation components. In general, the three-pronged approach (NOVA program, companion Web site, and library events) was very successful in educating the public about the concepts featured in the *Einstein's Big Idea* project.

The *Einstein's Big Idea* offerings appealed to the target audiences.

The vast majority of participants in the two viewer studies rated the program positively with adults rating it as *very good* or *excellent* and students rating it as *good* to *very good*.

The majority of visitors to the Web site indicated that they were *very* or *extremely* satisfied with the site, and reported that it was easy to navigate and that they were able to find the information they wanted. Further, they reported that they will visit the site again.

Adults, young adults, and children who attended *Einstein's Big Idea* library events provided positive feedback about their experiences. Over half of adult and young adult audiences reported that their event was *very* or *extremely enjoyable*. Similarly, most children reported that they had *a lot* of fun at their event. The majority of adults and children reported that they would be interested in attending similar events in the future.

Einstein's Big Idea programming succeeded in teaching the basic content related to $E=mc^2$.

As a result of watching the program, both NOVA viewers and high school students reported learning about the different pieces of the $E=mc^2$ equation. More importantly, each group showed statistically significant increases in their ability to identify the terms of the equation after watching the program.

Visitors to the Web site reported learning from *some* to *a great deal* for each of the seven key concepts surveyed. The equation $E=mc^2$ itself was among those concepts with the highest reported level of learning.

All three age groups reported learning from their library event. Adult and young adult audiences reported learning content related to the $E=mc^2$ equation with young adults, in particular, reporting the highest level of learning related to this content area.

Einstein's Big Idea also succeeded in teaching other key concepts.

The NOVA program was particularly effective in providing NOVA and student viewers with a deeper understanding of the multiple scientists whose work

contributed to the famous equation. Adults, in particular, reported learning about women and other "outsiders" in science at a high level. Both NOVA and student viewers reported that they were encouraged to think more about the program's learning goals as a result of watching the show.

Visitors to the Web site also reported high levels of learning related to Einstein and the other scientists who contributed to the equation, and the relevance of the equation to life today. They also increased their understanding of science as a human endeavor, a creative process, and a field that thrives on the contributions of diverse groups of people.

Library patrons of all ages reported learning about all of the program's key concepts from their library event. Almost all children reported learning something at their event, with most reporting that one thing they learned about was *science*.

***Einstein's Big Idea* succeeded in prompting further exploration of the key concepts and related ideas, especially from the other program components.**

After watching the NOVA program, almost all NOVA viewers either continued engaging with content related to *Einstein's Big Idea* or had plans to do so. Many had visited the program's accompanying Web site or taken other steps to learn more. Approximately one-quarter of students also planned to continue engaging with the program's content.

Most visitors to the *Einstein's Big Idea* Web site indicated that it had increased their interest in watching the NOVA program. The opposite was also true, with many survey respondents reporting that they visited the Web site to learn more after watching the show.

Both adult and young adult library patrons reported that they would continue engaging with content related to *Einstein's Big Idea*, with adults being more likely to report an interest in this area. Almost three-quarters of adult patrons, for example, reported that they planned to watch the show after attending their library event.

RECOMMENDATIONS

The current evaluation demonstrated that *Einstein's Big Idea* was a successful program. Each component was received favorably by its target audience, and consumers of each component learned new information and were motivated to think about the program's goals. Given these findings, GRG recommends that WGBH build on the success of this program in the following ways:

The docudrama presentation format of the *Einstein's Big Idea* NOVA program appealed to its audience and was a particularly effective way to demonstrate the role that women and other "outsiders" have made to science across history. GRG recommends that WGBH continue to produce NOVA programs in this format, as

appropriate. Further, data from across program components indicated that $E=mc^2$ is a topic of interest to the public. WGBH may want to build on this interest, and extend *Einstein's Big Idea* content further, by creating new programming to explore the components and use of the $E=mc^2$ equation in more depth.

The *Einstein's Big Idea* Web site offered a range of resources for visitors. The evaluation confirmed that visitors took advantage of these different types of resources, with visitors spending the most time reading articles in the *Inquiry & Articles* section and selecting a feature from the *Interactives, Audio and More* section as their favorite. GRG recommends that WGBH use this formula as a model for future Web sites which will allow visitors to learn about and experience NOVA concepts through multiple feature formats.

Finally, the *Einstein's Big Idea* library events have confirmed that libraries are interested in and effective at implementing science-based outreach initiatives. The model library sites, in particular, demonstrated the potential reach of this kind of outreach. Further, the model sites reported that they do not often have the opportunity to host science-based programming and that it was an effective way to highlight their science collection. GRG recommends that WGBH continue to use libraries as a source for outreach efforts. We further recommend that WGBH replicate the use of model library sites in future projects.

APPENDIX